December 1991 Issue #5

Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

in this issue

Albania on the Air

From Erkki "Eric" Heikkinen OH2BBF in Hanko, Finland: The International Amateur Radio Union (IARU) team of operators/instructors returned safely [*9 Oct. Release*] from Tirana, Albania after a most successful mission. Not only were some 71,000 contacts established, but also 12 Albanian citizens passed the amateur radio exam and are ready for operating.

The newly founded Albanian Amateur Radio Association will still have many challenges before things are up and running. The organizers of the ZA1A project have agreed to assist in many critical areas. If you or your organization are willing to assist this DXCC country, you can contact DF5UG, I2MQP, OH2BH, N7NG, or JA1BK. They will be happy to provide you with information and facilitate your interest. The names and addresses of the 12 new Albanian amateurs will be made public shortly, so that you and they can make friends.

The Albanian administration has forwarded (to the IARU/ARRL) information concerning amateur radio licensing in their country. For the ZA1A project, the PTT and the National Frequency Commission—the highest radiocommunication authority—issued amateur radio license ZA1A for the period ending 7 October 1991. Beginning October 8, 1991, they began issuing additional licenses with the next license going to a French team arriving in Tirana. The administration plans to issue callsigns in the ZA1Z block to foreign nationals seeking to operate in Albania.

On October 8, 1991, the ARRL DXCC desk reviewed the ZA1A documentation and accredited ZA1A accordingly. The QSL cards are acceptable for DXCC credit immediately. The hard-working NCDXF team is busy entering the QSO data while the QSL card design is ready for the printer. The NCDXF is aiming for the shortest ever turn-around time in QSLing for any major DXpedition. The first cards were mailed on October 26. They also advise two (only) SAE/SASE—one for cards processed normally, and one for problem cards. The QSL address is NCDXF, P.O. Box 1, Los Altos CA 94023, USA.

The organizers of the ZA1A project would like to extend their most sincere thanks to their many supporters and friends. They would like especially to credit Mr. Albert Muller HB9BGN, who coordinated the logistical operations in Zurich and offered his hospitality to all team members enroute Tirana. They would also like to credit Mr. Erkki Heikkinen OH2BBF for his diligence in keeping the information flowing out of Tirana. Martti Laine OH2BH is project coordinator.

Text from the ZA1A QSL card: THE FIRST LICENSED AMATEUR RADIO OPERATION FROM ALBANIA. The mountainous Balkan state of Albania is bordered by the Adriatic Sea, Yugoslavia, and Greece. Its population of three million people is now opening its hearths and homes after many decades of very strict order. Albania, rich in natural resources and beauty, also has an exceptionally warm people that should be welcomed into our international community of nations.

Part of the ZA1A crew at Durres, Albania L–R: Pekka OH1RY, Training Supervisor for IARU ZA1A Team; Agim Muco, Secretary-General of the Albanian PTT;Martti OH2BH, Project Coordinator of ZA1A; and Chip K7JA, representing Yaesu.

The ZA1A team was given the honor of establishing amateur radio in Albania and training 12 Albanian students to carry that seed further. Albania is no longer a rare country in DX; it is now within reach and open for your visit. Indeed, ZA-land can easily be the destination on your next itinerary. Contact ZA1A team members or any of the new licensees for details.

The ZA1A project has been a splendid example of international friendship among many individuals and national societies under the patronage of the International Amateur Radio Union (IARU). The assistance of the NCDXF, the Japanese CQ Publishing Company, the Yaesu Corp., and the Kenwood Corp. are also recognized by many of the Deserving throughout the world of amateur radio.

The international ZA1A team is comprised of DF5UG, I2MQP, I2KMG, I5FLN, IKØFEW, JA1BK, JA1HQG, N7NG, K7JA, W7SW, OH2BH, OH1RY, OH1VR, and OH2BAZ. The international supporting team includes: Richard Baldwin W1RU, President of IARU; Shozo Hara JA1AN, President of JARL and David Sumner K1ZZ, Executive Vice President of ARRL. In the Albania hosting team are: Agim, Artur, Dajian, Fatma, Fredi, Geni, Ibrahim, Maksim, Toli—with Arben, Dali, Gezim, Jovan, Lushi, Mirela, Niko, Sadik, Teo, Ylber, and many others.

Generous Hams

Excerpt from a newspaper clipping sent to us by Lloyd M. Mitchell of Hartsville, South Carolina: Last fall, a 13-year-old girl in Travelers Rest, South Carolina, received thousands of dollars worth of amateur radio equipment from a man she had never met.

Thirty years ago, William M. Kessel decided that when he died, all his equipment would be given to the youngest ham radio operator in Greenville County. Seven months after he died, his last request was carried out, and Jessica Lawrence was presented with a double-wide trailer full of radio equipment.

Sam Peek, Kessel's attorney, called John Chiam, president of the Blue Ridge Amateur Radio Society, Inc., to ask for help in finding the county's youngest amateur radio operator. Chiam contacted the ARRL. At the time of Kessel's death in February 1991, Jessica was the youngest ham. She was first licensed at the age of 11.

Another heart-warming story was reported by Bob Melucci KD6BP in "Squelch Tales," Vol. XIX, of the San Diego Repeater Association: Melucci writes: "My son, Nick, decided to become a ham last summer. He took the Novice written exam last spring, when he was 9 years old. One month later, he sat for and passed the Technician portion. I was later told that he was the youngest person to pass an amateur test at the San Diego exam site.

When he took the Novice portion, George Perhac KJ6XP (ex W3WRQ) was one of the VEs. He was also gravely ill. Impressed with Nick's interest and age, and recognizing that youth are the lifeblood of amateur radio, George bequeathed to Nick his complete 10 meter station and a 2 meter HT. The gift was contingent upon Nick's obtaining an amateur license. Before Nick took the Technician written exam, George passed away.

Continued on page 25

The QSL Card for ZA1A.

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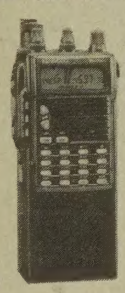

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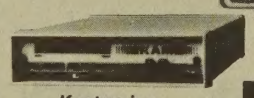

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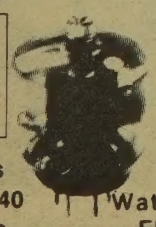

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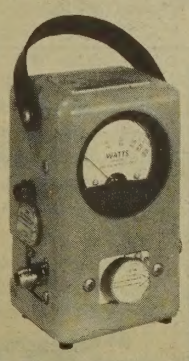

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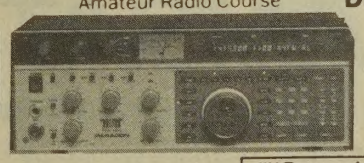

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What is SARA?

SARA, a French radio astronomy satellite launched last July, will be measuring radio frequencies from Jupiter. These signals can only penetrate earth's F, E, and D layers at the highest end of the spectrum. In space, solar and earth radiation is small compared to that of the giant planet's, so results are expected to be good.

SARA has a 1-watt NBFM output. It is 300 baud ASCII coded into 1200 Hz and 2400 Hz AFSK audio tones and transmitted at 145.995 MHz. SARA is a very simple satellite with three perpendicular 5 meter antennas that produce a combined quasi-isotropic pattern; hence, there is no need for stabilization. Its 340mm cube is powered by 60% coverage of solar cells feeding the battery, with no need for power or voltage regulation. The other 40% of the surface is painted so as to passively regulate the temperature to around +20 degrees C. It uses non-space qualified, normal consumer available components with no redundancy as backup. TNX *OSCAR Satellite Report, No. 231, SpaceNews, Satellite Operator Number 13,* and G3IOR.

Thanks from *Mir*

KP4BJD reports that Cosmonauts Sergey U5MIR and Anatoly U7MIR pass along their kindest regards and warm-hearted greetings as a measure of their appreciation to all the amateurs who have contributed news and information to their personal message system, U5MIR-1. Like the AREMIR Austrian Amateur Radio Experiment, the frequency of operation is 145.975 MHz. During a voice contact, Sergey expressed interest in contacting the next U.S. ham mission in space, currently scheduled for next May. TNX *SpaceNews de KD2BD.*

Tornado Warning

You can use your TV set or radio as a tornado warning device. Use the TV set first. Warm it up and tune in channel 13; darken the screen to almost black, using the brightness control. Next, tune in channel 2 and turn the volume control down. Your tornado detection device is now in operation.

Lightning will produce momentary white bands of varying widths across the screen (color sets produce colored bands). A tornado within 15 or 20 miles away will produce a totally white screen, which will remain white (a totally colored screen on color sets). This occurs because lightning and tornadoes generate RF energy at about 55 MHz (channel 2), which overrides the brightness control.

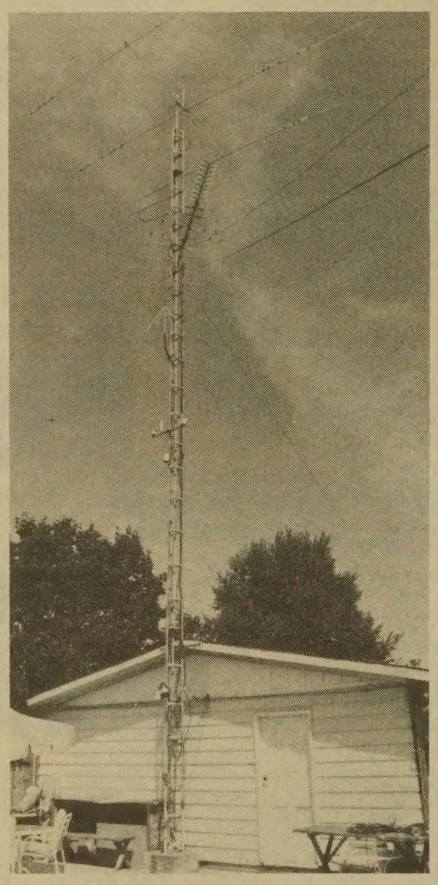
Channel 13, which is at the high end of the VHF band, is not affected. That is why the brightness control is set at that channel. If the screen whites out (or colors out), turn off your TV set, take your portable radio, and seek a place of shelter immediately.

Use the portable radio for emergency instructions, and in case of power failure. If the radio is turned to the 550 kHz–1600 kHz AM band, lightning will cause intermittent static. A tornado will cause steady, continuous static. Most homes have these two warning devices handy. It might be well to keep a copy of the instructions near your radio or TV during tornado season. TNX *The OMIK Communicator, Fall 1991.*

Another Opportunity

The Adventist Prison Commission, Inc., P.O. Box 459, Deer Park TX 77536, needs equipment and expertise in building up their mobile and base stations. Here's another opportunity to make a difference and have fun doing it. Any donations of time, skill, money, or equipment will help the commission, headed by Tim Culver, teach amateur radio to young people who have parents in prison. These young people often have no adults to guide them in creative, enjoyable activities that are also exciting and educational—and provide a service to the community as well. For more information, call Tim Culver (whose callsign is on the way) at (800) 327–1660.

Easy Rotor Installation



Here's a tip from Harry B. Elliott N8JQN: It's common practice to mount the antenna rotor high up on the tower, just a few feet below the antenna. In most instances, this means the rotor is approximately 50 to 100 or more feet above the ground. But my hobby is NOT climbing towers.

I mounted my rotor at eye level (see the photos), and I ran regular TV antenna mast from the rotor up to the mast to where the antenna is mounted.

It's a good idea to drill a hole and run a screw through the joints of the TV antenna mast to prevent slippage.

Just a couple of feet above the rotor, I supported the entire weight of the antenna and mast with a thrust bearing—so there is no weight on the rotor.

This rotor mounting accomplishes several things: 1. Easy access to the rotor for maintenance. There is no antenna climbing! 2. Easy removal of the rotor. The antenna does not have to be lifted. 3. A higher degree of safety, especially in high winds. The weight and mass of the rotor are not located at the top of the tower. 4. More economical. Less rotor cable is needed.

Photo A. This ground-level rotor installation (for a 50-foot tower and Cushcraft A3S antenna with 40m add-on kit) has worked well for N8JQN for the past three years.

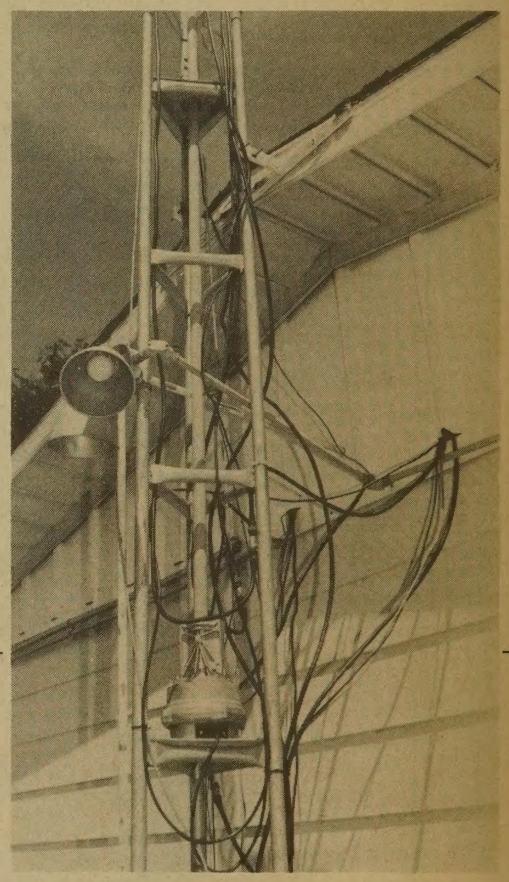


Photo B. Details of the rotor and thrust bearing.

"Secondary" Ham Communications

In a speech at the ARRL National Convention at Saginaw, Michigan, FCC Private Radio Bureau Chief Ralph Haller said he was receptive to permitting a "third type" of non-amateur communications on the amateur bands. At present, only two types of amateur communications are allowed: emergency and "all other" permitted amateur communications, such as rag-chewing. This third type would be permitted when the ham bands were not being used for the first two types.

And what is this third type? The use of ham radio for such things as personal and club business, ordering pizza via autopatch, providing information to the news media, rebroadcasting news and weather bulletins (NASA, NOAA, WWV, etc.), and supporting communications for local government, civic, and nonprofit activities.

The question is: If Rule 97.113, "Prohibited Transmissions," were changed to permit this third type of secondary transmission, to what extent, and in what ways, would it change amateur radio as a hobby?

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letters

Deborah Riehl, RN, KB7NFL, Bothell WA I'm an emergency department RN, and a Search and Rescue (SAR) volunteer. My first patient one morning was a woman nine months pregnant who fell asleep at the wheel and wrecked her car. I wondered why someone would fall asleep at the wheel at 0900.

The patient was wearing her seat belt and denied injury, but was having a few contractions, so I called a labor and delivery nurse down to monitor mother and baby. I left the room to chart notes, and when I returned there was a 2 meter HT parked on top of the monitor. The patient was a ham, and she'd spent the night as an ARES and Red Cross volunteer at a major apartment fire, finding housing for people who were left homeless. And she was still thinking of others.

She was worried that her radio would interfere with the monitor. When reassured about that, she tried to reach her husband on the SAR repeater to tell him where she was. I loaned her my half-wave extendable, and she was able to contact him.

Shortly he arrived with four other children in tow. I learned that whenever Linda is pregnant, she studies and upgrades. She must be going for Extra!

Don Payne KB5MRA, Rosebud TX I want to say a few words regarding the no-code Tech license. It seems that in many areas the no-code class is perceived to be a problem. Fortunately, in our area, that is not the case. The Temple Amateur Radio Club (TARC) has begun teaching no-code classes, and students wishing to go on and learn the code are elmered after passing the written portion. They also are encouraged to join others on a 2 meter simplex frequency, working with practice oscillators (or keyers, if they have them) to bring their speed up to whatever is needed for the class of license they seek.

Around here, the term "no code" is hardly used. The "no code" is not some splinter group whose members are tagged. If those who consider code an integral part of being a good amateur operator would climb off their high horse and get to elmering the newcomers in the delights of code, and make it fun, instead of trying to browbeat them into submission by making them feel like outsiders. I believe they would find the results more to their liking, as well as self-satisfying.

It took me nearly a year to get code at 5 wpm. If I had had the opportunity to get a code-free license, I'd have jumped. But I am already trying to get my code speed up for Extra. I'm hoping for a codeless Extra class entry-level license—Hi, hi!

Regarding the letter in issue number 3 from David Yancey: If you're not certain you want to spend your hard-earned money on study materials for your license without *knowing* what amateur radio is all about, I'd recommend going to a couple of your nearest ham club's meetings. If their club is anything like ours, they probably will start pestering you to take their classes, look at their stations, come to their special events, or be chairman or co-chairman of the next Field Day. Hi! It seems most clubs ask all in attendance to introduce themselves. When your turn comes, say something like, "My name is David, and I'm interested in finding out what ham radio is all about."

As for John Myers, I've been into CB since 1968, and I am not ashamed of it. I also feel no need to defend that fact. There's room in my life for more than that, however.

My 14-year-old daughter, Missy KB5PQJ, will be surprised to learn she's an "old geezer." She's been licensed since she was 13, and not close to being alone. A growing number of schools have ham clubs, thanks to enlightened people like Carole Perry WB2MGP.

What I want to say to young readers is: You could be the start of something fantastic in your area if you develop a positive attitude and do it! However, the knowledge and history the older people could share is priceless.

And what about that old "geezer-in-chief" Wayne Green? Perhaps someone will have a certificate made up for him, to that effect. (At 40, I suppose I'm an "associate geezer.") Mr. Green may not be young in years, but he has more energy than most of today's youth—mentally as well as physically. He doesn't need me to defend him, so I'll only add that I wish I had some of the water from whatever fountain he drinks from.

Joe Mocker W2CZP, Schenectady NY I am an old-timer and know your publication is for Novices and Technicians, but is it *fun* to read!

Jeffrey L. Wheat N6ZYX/AG (ex KC6KVM), Norton AFB CA I just got issue #2 of *Radio Fun*, both issues are good. I was thinking that you might have a short trivia or "history notes" feature or department exploring, say, one question per issue.

I plan to share this issue with my ham class at church for Cub Scouts, Boy Scouts, and anybody else wanting to learn. It was not that long ago that I was having a hard time getting 5 wpm when my wife Gloria (now KC6JZR) started taking my oldest son Shaun (now KC6KRZ), age 7, to a kid's ham class. Both of them snookered me to Novice. I was proud and inspired that much more. The instructor of my class used me as an example for others to invite all kids to become hams.

Last club election, Shaun, then almost age 9, wanted to run for president. His idea was to make things more fun. More later!

So . . . . Did Shaun get elected? David N1GPH

Louie Metz N5SQV, Bella Vista AR Hooray for *Radio Fun*. More fun! I enjoy any articles you might have on antennas, feedlines, connectors, coax cable, and anything else of interest to dumb hams like me—not too tech-nical!

I enjoy your magazine, and I was tickled when I got a copy in the mail today—only to discover I already had issue #2! Enclosed are the labels on each—I only need one per month—but will give this extra copy to a new ham! I think your magazine is great for us

Continued on page 8

Build This Cornerless Quad for 2 Meters

Here's an antenna that you can cut corners on. All you lose is high cost.

by Nick Testa K6KTS

A little over a year ago my oldest son, Nick, now KA6OXP, expressed an interest in becoming a ham. After I dusted off a lot of vacuum tubes, it became clear that some new equipment was in order. Among the things purchased was a pair of 2 meter hand-held transceivers.

Back on 2 meters after many years, I wondered whether I could work some DX and contact my old friend Tom WA6FIO. Tom lives some 50 miles away, across Los Angeles. Our first contact was via repeater but left a lot to be desired in a rag-chew, with timers, QRM, and breaks to contend with. After spending a modest fortune to re-equip our ham shack, the prospect was dim for obtaining a linear or even a commercial high-gain 2 meter antenna. Enter LC4ELQ!

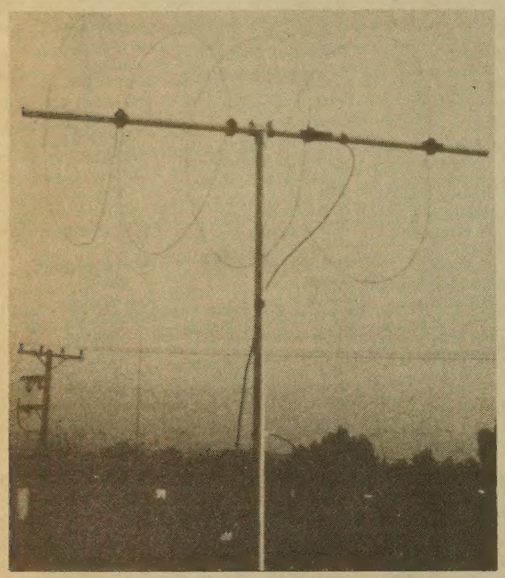


Photo A. The LC4ELQ.

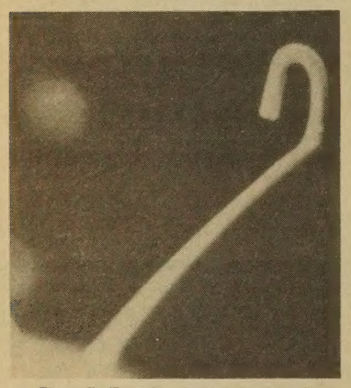


Photo B. Forming the bolt hook and the 90° bend.

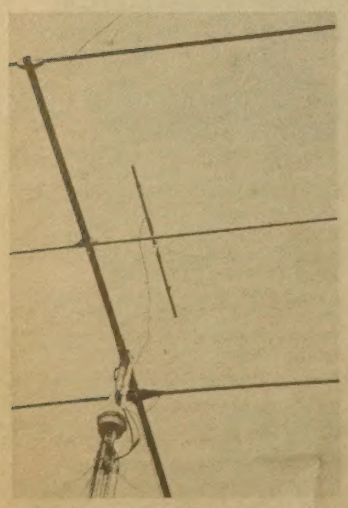


Photo C. The LC4ELQ antenna mounted

The LC4ELQ

The LC4ELQ is the answer to the question of how to boost your signal and reception on 2 meters at the lowest cost. If you have a low-power hand-held and want to use simplex across substantial local distances, as I did, or an SSB transceiver and are looking for the real DX, then LC4ELQ is for you.

It stands for Low Cost 4-Element Loop Quad. The antenna design is based on the 4-element quad but with some important changes to cut costs and simplify construction. A well-stocked junk box may contain all the necessary parts. Even if you have to buy all the parts new, except for an entire case of wire (which you will need only a small portion of), the expense will be under $10.

Construction

My trip to the junk box yielded some 3/4-inch schedule 40 PVC pipe left over from a sprinkler system installation and a quantity of #8 aluminum ground wire (Radio Shack #15-036) left over from grounding my low-band rig.

Since I was interested in the design which would have the best chance of being self-supporting, I decided to make the elements loops instead of squares. This has the added advantage of allowing adjustment of the element size without the constant adjustment of corners. This in fact proved very handy at the tune-up-stage. Due to the stiffness of the #8 wire, adjusting corners would have made the antenna look like it had been salvaged after being hit by a truck.

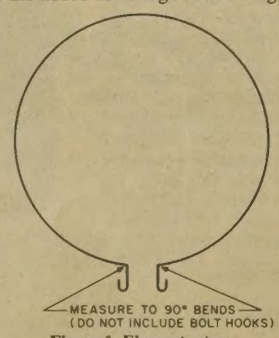


Figure 1. Element setup.

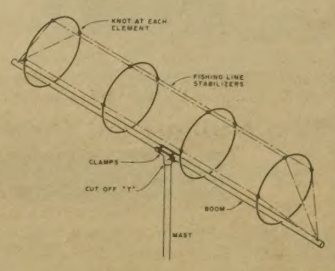


Figure 2. Mounting pattern for the

Four pieces of the wire were cut to length for a driven element, a reflector, and two directors. The lengths were determined as in a 2 meter quad design, such as is found in the *ARRL Antenna Book*, plus one inch to allow for forming hooks at the attach points, less the length of the bolts through the boom for the reflector and director elements. In those three elements the 1/4" x 2" bolts serve as one inch of the resonant length. Each element was then formed into a hoop with the ends bent at 90 degrees and then bent to fit around the bolt and screw heads.

The next step was to prepare the boom and mast. I cut the 10-foot piece of PVC into a four-foot and a six-foot length. I also cut the top bar of a PVC T-joint in half lengthwise. The stem portion of the T was glued to the end of the six-foot piece of tubing to form the mast. I mounted the four-foot length for the boom in the U-shaped cradle formed by the remaining top of the T, using a pair of 1-1/2-inch diameter hose clamps. The hose clamps can be loosened to allow for rotation of the boom for vertical or horizontal polarization.

Three 1/4-inch holes were drilled through the boom, one for the reflector and one for each of the directors. A 5/64-inch hole was drilled through the boom for the driven element. A 1/4" x 2" hex-head bolt was passed through each of the larger holes, with a pair of flat washers on each side of the boom. The small hooks at the ends of the elements were slipped between the washers at each side and a nut was used to fasten the assembly.

For the driven element, a #8 x 3/4" sheet-metal screw was inserted in each side of the boom. Each screw has a pair of 1/4-inch washers and a #8 washer, nearest the head, mounted on it. When the driven element is mounted, the shield and center conductor of 50 ohm coax are connected, one to each screw. The screw acts as a terminal to connect the coax to the antenna. Solder or crimp #8 spade lugs to the end of the center conductor and shield to ensure good attachment to the antenna.

To tune the antenna, I adjusted the element lengths and spacings until the antenna provided a nearly perfect match to the transceiver across the entire 2 meter band. This gave me a prototype antenna with a few extra holes in the boom. The final lengths are shown in the table of element lengths. Be sure to note that the table gives the length between the 90-degree bends, not to the tip of the wire. I recommend that you form a 90-degree bend and a small bolt hook on the end of the wire and then measure to the next bend point. Make the bend, allowing enough wire to form the hook around the bolt or screw, and then cut the entire piece off.

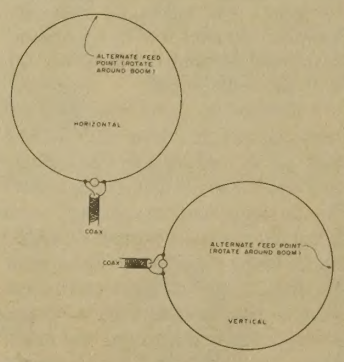


Figure 3. Feed points for horizontal and vertical polarization.

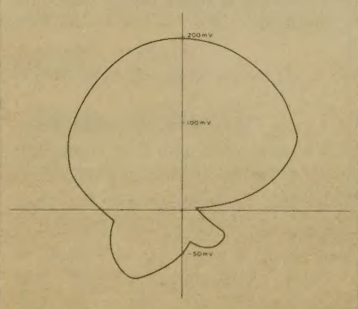


Figure 4. Antenna pattern measured by N6FFA and KD6EH in millivolts of signal. The LC4ELQ was used as the transmitting antenna and rotated to produce the pattern.

In making the SWR measurements, I noticed that the relative motion between the elements was enough to change the SWR. To prevent this, I added three pieces of fishing line tied to each element and to the ends of the boom, which extend beyond the elements. If, for example,the loop is fed at the six o'clock point looking at the antenna straight down the boom, a length of fishing line runs along the nine, 12, and three o'clock positions. A knot was tied at each element with a slight inward bend of the wire at the knot point to retard slippage. The ends of the three pieces of fishing line were tied together and then passed through spare holes at each end of the boom. George N6FFA, in testing copies of the antenna, found that squareness to the boom and parallelism of the elements to each other reduced the rear lobe of the antenna. That means you should do the best job you can in these areas. For long-lasting protection of your connections, wrap each with electrical tape or, better yet, use a commercial silicone sealant to cover them.

Polarization

What would you like? Since I was interested in FM, I wanted a vertically-polarized antenna. I rotated the boom so that the feed point was on the side, three o'clock or 9 o'clock looking down the boom. This gave me vertical polarization. For horizontal polarization, place the feed point at the top or bottom of the loop, 6 o'clock or 12 o'clock. With vertical polarization, N6FFA did notice a reversal of the deep rear-side notch in the pattern, depending upon which side the feed point was on.

Testing

Initial tests were made with the mast held by rubber bands to the desk drawers in my shack and the boom six feet off the floor. Readings were taken on a Swan VHF reflected-power meter. Also checked was the performance in vertical and horizontal polarization, and rough checks of directionality were made. The antenna was then clamped above my tribander at 40 feet. SWR tests were then repeated using a Bird Model 43. Both sets of test results are shown in the tables.

With the help of Judi WB6SKE, I made the first pattern check. It indicated a front-to-back ratio of 20 dB. This data is also shown in the table. The distance between our QTHs is about four miles. N6FFA and Greg KD6EH made the radiation pattern graph shown from the millivolts of signal measured at Greg's location about 12 miles away from N6FFA.

Element Wire Lengths

Element	Length in Inches from 90° Bend to 90° Bend
Director #2	73-3/8
Director #1	74-3/8
Driven Element	79
Reflector	83-1/4

Element Center-to-Center Spacing

From	To	Distance in Inches
Boom end	Director #2	6
Director #2	Director #1	11-3/4
Director #1	Driven Element	8-5/8
Driven Element	Reflector	14-1/8
Reflector	Boom End	≈7

Frequency in MHz	Measured SWR Final Adjustment Values (Swan)	Measured at 40 ft. (Bird)
144.0	1.35	1.45
144.5	1.20	1.25
145.0	1.00	<1.14*
145.5	1.00	<1.10*
146.0	1.00	<1.10*
146.5	1.10	<1.10*
147.0	1.30	<1.10*
147.5	1.40	1.22
148.0	1.55	1.35

*Lowest reading on the chart.

S-Meter Measured Antenna Pattern

Degrees	dB over S9
0 (front)	30
15	28
45	28
75	28
135	10
165	20
-(back)	
195	19
225	20
255	25
315	25
345	28

Performance

Yes! I was able to work WA6FIO simplex at nearly full-quieting across the Los Angeles QRM with 1.5 watts. This same power level has easily provided reliable, nearly full-quieting communications via repeaters located in other cities nearly 200 miles away. My QTH is situated on flat land at about 50 feet above sea level, so our own elevation is not a factor. Several other local hams have built and used the antennas on both FM and SSB with excellent results. I constantly receive the comment on the air, "You're that far away and just using 1.5 watts; that's some antenna!" Try one for yourself and see what I mean.

Conclusion

The LC4ELQ is hard to beat for return on your dollar investment for each watt of effective radiated power. The ease of assembly beats anything with spreaders. One fellow says he has built several and it now takes him much less time than the 45 minutes that he spent on the first. RF

This article is reprinted from the May 1983 issue of 73 Magazine.

Parts List

Quantity	Description	Source
1	10-ft. piece of 3/4" schedule 40 PVC	Hardware store
1	3/4" PVC T-shaped fitting	Hardware store
2	1-1/2" hose clamp	Hardware store
3	1/4" x 2" bolt	Hardware store
3	1/4" nut	Hardware store
16	1/4" flat washer	Hardware store
2	#8 sheet-metal screws	Hardware store
2	#8 flat washer	Hardware store
27 feet	#8 aluminum ground wire	Radio Shack
35 feet	#12 monofilament fishing line	Sporting Goods

Solder and Soldering

by Joseph Crowling K4CPR

Soldering is one of the oldest and simplest methods of joining electronic components. Because of its simplicity and ease of application, it is often used but seldom studied or analyzed. It deserves more attention than amateurs give it. Murphy's law applies to soldering. If taken for granted, soldering can cause trouble.

Alloys

Soft solder, consisting mainly of tin and lead, is used for most electronic assembly. Soft solders make connections by virtue of a metal solvent action that takes place at low temperatures. The solvent action makes solder joints chemical in character rather than purely metallic.

Commercially available solders cover the entire range of tin-lead ratios from pure tin to pure lead. What is the best alloy for electronic assembly purposes? To answer this question, you have to remember that the primary purpose of solder is to connect two or more metals, but you also have to consider resistance to stress and strain, speed of alloy formation, flow and spread of the solder, and chemical stability of the joint. No one alloy meets all the requirements, but for electronic assembly a fairly large range of alloys give good results.

Adding tin to lead lowers the melting point. An alloy of 63% tin and 37% lead has the lowest melting point (361 degrees F). It is known as the eutectic alloy. This alloy does not pass through a plastic state before it becomes molten. If more than 63% tin is added, the melting point temperature will begin to rise again. The best alloy for holding up under strain has about 60% tin and 40% lead. Alloys from 50–60% tin and 50–40% lead will give good results for most amateur needs.

Flux

All metals are covered with an oxide film. This film is nonmetallic and will prevent the metal solvent action (soldering) from taking place. Flux is added to the solder in order to remove the oxide film and allow the clean metal surfaces to make contact. The flux will remove only the oxides. It will not remove paint, dirt, or other foreign matter. The choice of proper flux is one of the most important steps in obtaining good solder joints. There are hundreds of different fluxes, but for the purpose of discussion, they will be divided into four groups: (a) rosin, (b) activated rosin, (c) organic, and (d) acid.

Rosin flux gives good fluxing action. This flux is corrosive only when heated to a molten state. The corrosive action is needed to remove the oxides from the components being soldered. When the heat is removed, the residue left is noncorrosive and electrically nonconducting.

Activated rosin fluxes have a more effective fluxing action than pure rosin. They were developed to meet the demand for a faster, more efficient soldering process. The residues should be noncorrosive and nonconductive. Be careful when purchasing activated rosins; some of the advertising may be unclear.

Organic fluxes are more effective than rosin or activated rosin, but they leave corrosive residues. These fluxes are used when the fluxing action of rosins is insufficient and small amounts of corrosion may be tolerated. The residues should be removed.

Acid fluxes are the most effective, but they leave corrosive and electrically conductive residues. The word "acid" is a misnomer since the fluxes are actually salts. The residues absorb moisture from the air and the corrosive action is probably due to galvanic or electrolytic action. These fluxes are used only when their great activity is needed. Kit manufacturers will not guarantee their kits if acid core solder is used.

The choice of a flux can be a complicated problem, but you will not go wrong if you choose the least active flux that will give good results for your particular application. For electronic assembly, pure rosin or some of the activated rosins would be the best choice.

Soldering

After the choice of a proper alloy and flux, good soldering becomes a function of the individual's technique. For good solder joints, the following must be observed:

1. Use the proper alloy and flux.
2. The soldering iron must be of sufficient wattage rating. (Don't try to use a 25 watt pencil iron to make a connection to a ground lug on a large aluminum chassis, and don't use a 125 watt gun type iron on a printed circuit board.) The iron should have a bright, smooth, tinned tip for most efficient heat transfer to the joint. Clean the tip periodically.
3. All elements of the joint should be clean. (No dirt, paint, grease, or other foreign matter.)
4. Use the iron to heat the joint and apply the solder to the junction of the tip and the joint. Remove the iron when the solder wets the joint. Don't use excessive solder. The joint must not be jarred or subjected to vibration before the solder cools. Such motion will cause cold solder joints.
5. Inspect each joint. A properly made joint has a smooth appearance and a satin-like luster. Wiggling the components of the joint by hand, or with pliers, will also help make sure the joint is a good one.

Given the proper tools and a little experience, anyone can make good solder joints. Because of the simplicity of soldering, many people take it for granted and never bother to learn the fundamentals. Soldering is simple, but it can cause trouble. The failure of a solder joint acts the the same as the failure of a component, but it can sometimes be much harder to find. Don't let a few cents of solder ruin the performance of hundreds of dollars of electronic equipment. RF

This article was reprinted from the March 1966 issue of 73 Magazine.

letters

Continued from page 5

Novices, no-code Techs, and dummies that didn't grow up in electronics, but got into it at a later age, like myself! Keep up the good work. How about some more information about nets, code, and voice?

New subscribers who are also new hams will often receive one or two "double" issues. I hope all will follow your lead and share the extra copy with a potential new ham. David N1GPH

C.R. Cohouru "Coby" N3KLT I enjoy your paper very much. So far I have only a Kenwood 241A 2m and 450S/AT. I just got my license this spring at the age of 72, and do enjoy the hobby.

Don Vlack KB2KLP, Churchville NY I wanted to let you know that I just received my second issue of *Radio Fun* and eagerly read the whole thing from cover to cover, as I did the first issue.

I have been a ham for a little over a year, and although I upgraded quickly to General, I often feel as though I'm still a Novice, and the format of your magazine is terrific. So far, I think that you are fulfilling your goal.

Joel Levine's article alone is worth several times the subscription cost for the whole year. If you have just one article like that per issue, you can count on my subscription for several years to come.

My first station was picked up at the local hamfest just the way he describes. An old Heath DX-60 for the transmitter, and an old Hammarlund HQ-170 for the receiver. Well, I've upgraded to a Yaesu FT-101 transmitter (also hamfest purchased), but I'm still using the HQ-170. Although I've been lucky and had a good elmer to help me with the equipment choices, with the information in Joel's article, I'll feel much better going out on my on. There's still magic in those old rigs—as Mike Bryce says!

All of the articles are terrific, and I think that the ad ratio is OK. And yes, I am going to send in my reader service card. Once again, thanks for the great magazine.

Don, thanks for the nice letter. No matter what kind of gear you buy, that ol' DX-60 and HQ-170 will always be special to you. Keep them in good shape and someday you can have the joy of watching some young Novice make his first contact on the same rig. David N1GPH

Kenneth P. Long KF2BO, Rome NY Have read your Premier and September issues, and think the magazine is excellent. I offer the following suggestion for your consideration, given the orientation toward the newcomer: There is much literature on basic electronics, reading schematics, resistor and capacitor values, etc. However, practical advice is difficult to find for newcomers, and also for tube-era old-timers, on such things as: how to trouble-shoot; how to properly handle/install static-sensitive devices; how to test ICs and transistors for proper functioning; how to identify polarities of capacitors, LEDs, etc.; how to know when correct polarity orientation is critical; how to trouble-shoot one of the "simple" devices described in magazines after it is built, doesn't work, and construction seems to have been correct; and so on. The common advice seems to be to consult your elmer—but that isn't always possible or practical.

I think articles covering the above and similar subjects, or expansion of construction articles to do the same, would be of benefit to the newcomer, and those who could find their way around tube-type circuits but are baffled or nervous when confronted with a solid state circuit.

Kenneth, keep an eye on "The Tech Side" column in Radio Fun *and "Ask Kaboom" if you get* 73 Magazine. *(If you have specific questions, drop a line to Michael Geier KB1UM, the columnist.) I, too, get a little nervous when sticking my nose into solid state gear. I'd sure like to see some articles submitted on this topic. In fact, some articles on finding your way around tube-type gear would be welcome. Writers? David N1GPH*

Ken J. Harkcom KD4ELV, Tampa FL As a proud member of the Tampa Bay Amateur Radio Society for the past four months, I would like to advise you of a club project we are conducting that may be of interest to other clubs.

Our club president, Brian Lantz KD4BGH, suggested that the club supply copies of our club newsletter, *QSP*, to local Radio Shack stores so that their customers and prospective hams could have a contact point to direct their questions about ham radio to. I made up a circular/flyer to insert into each newsletter with some general information on the hobby, the club, and members to contact for more information.

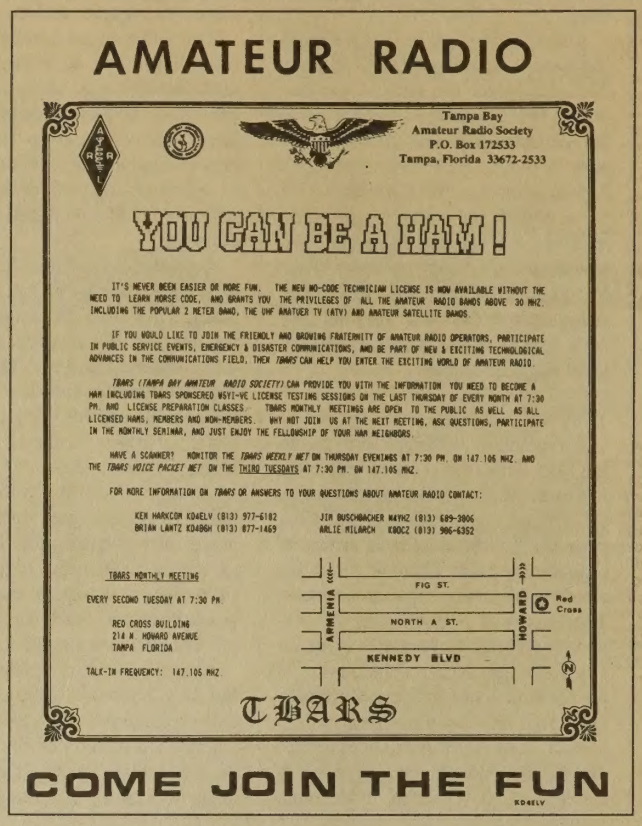
I am proud to announce that in the three weeks since this project started, I personally have had over 43 phone calls from people wanting information on becoming hams, including three who called back to tell me that they had passed their exams (one Novice, one Tech-Plus, and one Tech-Lite).

The Radio Shack managers welcomed me with open arms, several stating that they had had many questions on ham radio from their customers in the past, but had no contact sources to refer them to. Several also asked for extra copies of the flyer to post on their front windows, and for their display of their new 2 meter rig available October 17.

Due to the response TBARS has had in only three weeks, I highly recommend this project to all amateur radio clubs. The flyers can be sent to schools, electronic shops, etc., and made available at club sponsored events such as Field Day, NTS traffic booths, public service events, etc., and the extra copies of club newsletters won't just sit on a shelf somewhere.

Thank you for this opportunity to let you know that amateur radio clubs don't have to be boring and limited only to those who can show three burns from vacuum tubes! TBARS has a guest speaker at each monthly meeting, and several of the topics scheduled for future meetings include: NTS traffic handling, packet operations and BBSs, weather and how amateur radio can help in local disasters and warning systems such as SKYWARN, proper grounding of amateur radio stations, and local electrical codes unique to amateur stations (presented by electric company representatives), and a discussion on how amateur radio differs in Europe (presented by a recent transplant from England).

Readers: See the copy of TBARS's excellent flyer, reproduced in this "Letters" department. It can give you some good ideas about designing your own. Linda KA1UKM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TBARS

COME JOIN THE FUN

KD4ELV

Do you want to make a flyer to promote interest in amateur radio and attract new club members? TBARS's flyer can serve as an excellent model to start the ideas flowing. Clear, direct, and informative, TBARS's flyer has everything.

Jeffrey C. Montgomery WB4WXD, Palestine TX I would like to congratulate you on the production of a fine magazine for the young and old ham or non-ham. I have enjoyed reading all issues from cover to cover, and find interesting ideas contained in each issue.

I would like to comment on a letter found in your issue number 3 from Dave Hockaday regarding the ARRL VE session that he attended with his wife. The situation in which she found herself after the 50-mile drive was not pleasant, I am sure, and the VE in question could have handled the confrontation better; but he was half right according to my FCC rule book. I say he was half right because he should not have accepted the Novice written portion even if he had wanted to. Hockaday's wife passed her Novice written at a session overseen by two General class hams who could only send in a completed 610 form for the "standard" Novice license which consists of written and 5 wpm code. Since they were not operating a VE session, they could not issue her a CSCE. A CSCE is required for a VE to give credit for a previously taken element not covered in an existing license. Therefore, the VE had no way of accepting the Novice written portion as a completed element.

I think that the VE could have explained this to Mr. Hockaday and his wife at the time, and the problem would have been solved. I also think that a comment on your part after his letter would also have helped inform readers not fully aware of all aspects of the VE program. Our Novice classes specifically point out this situation when students are shown the difference between the code and no-code Tech licenses.

Sheryl Schuff KB9EGH, Indianapolis IN In answer to the question in the October 1991 *Radio Fun*, no, Cheickna S. Baber N4ZXA is not the youngest Extra class amateur in the U.S. I don't think that should take anything away from this marvelous accomplishment, and the youth should receive everyone's congratulations and recognition. I'm sure that N4ZXA will be an inspiration to many hams of all ages.

I don't know for certain who is the youngest U.S. Extra, but one who is younger than N4ZXA is my son, Reuben Schuff AA9BY, formerly KB9EGP. Reuben passed his 20 wpm code test on June 15, 1991, Element 4A on July 20, 1991, and Element 4B on August 17, 1991, therby qualifying for Extra class while he was still 9 years old. His 10th birthday was September 8, 1991.

I'd like to see more publicity on ALL the young hams, particularly those younger than high school age who have progressed to General class or above.

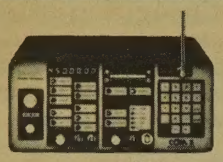
Sheryl—Thanks for your nice letter. When I was nine years old, I think I was still trying to figure out what the tooth fairy did with all those teeth! Congratulations to Reuben. David N1GPH

Bill Baker N5UMH, Norman OK Thanks for a nice publication. I really enjoy it. Good articles so far. Helpful and informative for a new ham, or for one who has been in it for a while, but who has not been able to spend as much time at the hobby as they would like.

I put together a 10m coaxial dipole, as described in the Sept. issue, the night before leaving for a few days' vacation in Colorado. With my Ranger, I worked stateside and Australia.

I might as well also use this as a sounding board for something irritating—Generals and higher class hams running well over 200 watts in the Novice section of the 10m band, and certainly not being bashful about it. With the standards required for licensing, the rather strict policies and operating attitudes demanded in amateur radio, I was surprised at this. It seems almost contradictory to the staunch, stoic attitudes that you find elsewhere in the hobby. RF

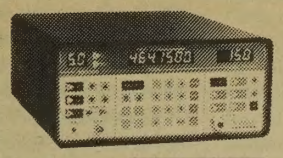
RAMSEY ELECTRONICS



COM-3 $279.00

2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.



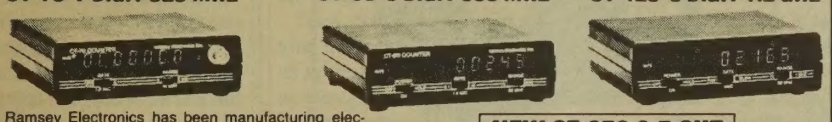
RSG-10 $249.00

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • –130 to +10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz **CT-90 9 DIGIT 600 MHz** **CT-125 9 DIGIT 1.2 GHz**



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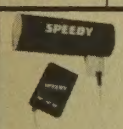
NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic ship antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$ 9.95
Rechargeable internal battery pack, BP-4	$ 9.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	< 25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95



SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit $29.95
TR-1, RF sensed T-R relay kit ..$ 8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.
FM-1, basic unit ..... $ 5.95
FM-2, as above but with added mike preamp ..... $ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit $16.95
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SMC, miniature sensitive mike cartridge for FM-1, 2, 4 ..... $ 2.95

MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
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MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 $12.95

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.
Complete kit, PC-1 .... $49.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
Each kit $17.95

TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 $5.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit. $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit $14.95

NEW SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 ..... $29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
TS-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."
Transmitter + receiver set, LB56 . . $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit $14.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
BN-9 kit $5.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

NEW FANTASTIC 2M FM TRANSCEIVER

SYNTHESIZED—NO CRYSTALS TO BUY!

$149.95

Ramsey breaks the price barrier on 2 meter rigs! Here's the ideal rig for field days, hamfests, vacations, second cars and packet (it even has dedicated packet connections). Six expandable diode-programmed channels, 5W RF output, sensitive dual conversion receiver and EASY assembly. Why pay more for a secondhand old rig when you can make your own for less. Have some fun with your own truly AMERICAN-MADE FM rig! This kit comes complete except for the case, mike and speaker—ICOM or equal speaker-mikes plug right in. Add our own beautiful case set for a professional factory look.
FTR-146 kit $149.95
FTR-146-C metal case & knob set $24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $79.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $79.95

QRP TRANSMITTERS HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands $27.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit $24.95
Matching case knob set, CCW $12.95

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit $29.95
Matching case & knob set, CSS $12.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $27.95
Shortwave converter kit, SCI $24.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit $29.95
Matching case set, CFM $12.95

AIRCRAFT RCVR

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit $24.95
Matching case set, CAR $12.95

TERMS Satisfaction guaranteed, examine for 10 days. If not pleased, return in original form for refund. •Add 7% (up to a maximum of $10) for shipping, handling and insurance. •For foreign orders add 15% for surface mail. •COD (USA only), add $4.50. •Orders under $20, add $3.00. •NY residents, add 7% sales tax. •90-day parts warranty on kits. •1-year parts & labor warranty on wired units.

VISA MasterCard

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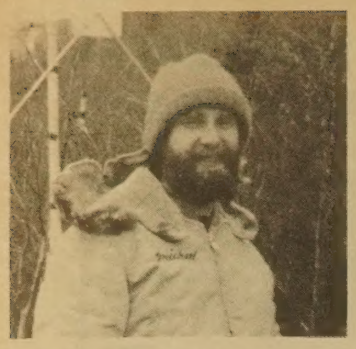
RAMSEY ELECTRONICS, INC. 793 Canning Parkway, Victor, NY 14564

CIRCLE 34 ON READER SERVICE CARD



the tech side

by Michael Jay Geier KB1UM

Ask Away

This time, we're going to take a detour from our discussion of building and fixing, thanks to a letter to the editor from Bob Williams KA7VJD, which appeared in the October issue. Bob had some pretty good suggestions and questions. Let's look at a few now.

Bob suggested that we start a question and answer column. Well, folks, that's what I'm here for! From the beginning, this column was intended to serve as a forum to help answer your technical questions and try to solve your troubleshooting problems. I'm not an antenna maven, nor am I an expert on propagation or contesting. My specialty is circuitry, and solid-state circuitry in particular. I can also help with theory, from basics like Ohm's law on up to hairier things like phase-locked loops. So, ask away! Write to me in care of *Radio Fun* and the editors will forward your letters to me. One thing, though: Like most of you, I'm usually rather pressed for time, and I just can't answer letters directly. I'll do my best to get appropriate stuff into this column, but please save your stamps and SASEs. Thanks.

Bob specifically mentioned that he really couldn't explain the various kinds of modulation, like USB, LSB, FM, etc. Bob, you're not alone! From what I hear on the air, that topic is the center of much confusion, misinformation and rumor. What say we take a look at it now?

Going Through Changes

Modulation is the process by which we impress intelligence (our message) upon a radio signal in order to get the message to someone else. Let's face it, a plain, steady carrier is mighty boring to listen to! There are lots of types of modulation, but they can be roughly categorized into two major groups: amplitude and frequency. Let's look at the various kinds of amplitude modulation first.

Amplitude modulation includes good ol' AM, CW (Morse code) and also SSB (single sideband). In CW, the carrier, which is just a sinewave at a frequency high enough for radio propagation, is turned on and off by your key. Really, it should be called Interrupted Wave! It was called Continuous Wave to distinguish it from spark transmissions, in which the carrier died out during each dit or dah (that was called "Damped Wave"), and the name has stuck ever since. In AM, the carrier has its amplitude (size or power) made bigger and smaller in step with the audio signal corresponding to your voice. Because the frequencies in the voice signal are many times slower than that of the carrier, each voice "wave" modulates many carrier waves. So, from one carrier wave to the next, there doesn't appear to be much change, but there is some. More about that in a minute.

Once upon a time, in the very early days of radio, there was great debate as to whether an intelligence-bearing radio signal (in other words, one which was modulated in some way) could exist at a single frequency or might occupy a band of frequencies. On an actual receiver, it seemed to occupy a "bandwidth," but the effect was attributed by many people to the lack of selectivity (or "narrowness") of their receivers. And, they pointed out, CW Morse code, which was the prevalent mode in those days, obviously couldn't have any bandwidth because it was either on or off. When it was on, it was just an unmodulated carrier and when it was off, it wasn't there at all! All in all, the "width-less" theory was very attractive because it suggested that an infinite number of stations could share any band if only the receivers could be made selective enough.

Any pessimist could've set 'em straight! Real life just doesn't work that way, and radio is no exception. Mathematical analysis proved once and for all that signals did indeed occupy a bandwidth. Further, that bandwidth was directly related to the frequencies modulating the carrier and it was predictable. Before we go on with this, let me answer the obvious question: When the CW Morse code signal is on, it has no bandwidth. Obviously, when it is off, it has none either. But at the instant it turns on and off, it *does* have bandwidth, and the faster you send the dits and dahs, the greater that bandwidth. Clever, huh?

The math also proved that the only wave which contains energy only at its fundamental, or obvious, frequency is a perfect sinewave. Any other shape of wave will have some energy at other frequencies. Imagine a bunch of perfect, pretty sinewaves. Now imagine that we are gradually making them bigger and smaller with our modulation. Clearly, some of them will have their beginnings bigger or smaller than their endings. In other words, they aren't perfect sinewaves anymore! In a sense, modulation is *distortion*, at least from the carrier's point of view. And, if you have imperfect sinewaves, you have some energy at other frequencies. As it turns out, those frequencies will be offset from the carrier frequency by exactly the same amount as the modulating frequencies. Thus, if you modulate a 14.000 MHz (megahertz) signal with a 3 kHz (kilohertz) tone, you get energy which extends from 14.000 MHz to 14.003 MHz. The 3 kHz adds to it! Wait, it gets worse. You *also* get energy down to 13.997 MHz, because the frequencies subtract as well as add. What a mess!

Ultimately, it works out like this: Because the frequencies add and subtract as the cycles swing back and forth, the energy at the carrier frequency goes neither up nor down; it just sits there. The energy in the sidebands, however, goes up and down with the modulation, and the amount of energy is split evenly between the upper and lower sidebands. Each sideband winds up with one-quarter of the transmitter's total output, and the carrier, which carries no intelligence at all, gets one-half.

So, if you think about it, only one-quarter of the transmitter power is really being used to convey your message, with another quarter duplicating the effort and a full one-half doing nothing at all! Also, the total bandwidth taken up by your station is twice the original modulating frequency, and twice as wide as it really needs to be. If that seems wasteful to you, you're right! Early on, hams, whose output power and band space were limited by law and economics, looked for a more efficient scheme. They found one. It's called Single Sideband (SSB).

Off with Their Sidebands

If only one sideband actually does anything, it seems logical to put all the transmitter power into that and scrap the rest. Logical, yes. Easy, no. The add-

ing/subtracting process of AM is a natural part of the process, and getting it to go in only one direction is a bit tricky. Nonetheless, hams were experimenting with SSB in the fifties and it was in common use by the mid-sixties.

There are several methods of producing SSB, but the one most commonly used today is a simple filtering process. A technique known as "balanced modulation" permits the generation of a signal with two sidebands but no carrier. This is called a "suppressed carrier" signal. Believe it or not, you can do that with just four diodes! The harder part is getting rid of the other sideband. The signal is passed through a very narrow filter. The filter passes the sideband whose frequencies fall within its frequency range (known as the "passband") and rejects the other sideband (because it is not in the passband). Voilà, SSB! By selecting which frequencies are passed and rejected, either sideband can be passed. In upper sideband (USB), the sideband above the absent carrier's frequency is passed, while in LSB the one below it is passed.

Quack Quack

If you've ever listened to SSB on an AM receiver, you know what I mean when I say it sounds like Donald Duck. You can tell that it's someone talking, but you can't make out what the sender is saying. Why not?

Well, when you chop off the carrier signal, you are altering the wave shapes of the transmitted signal, and this causes a peculiar distortion of the received signal *if it is processed by a receiver not intended for it*. In other words, the intelligence no longer corresponds exactly to the envelope (overall strength changes) of the signal, and AM receivers use envelope detectors to decode the signal into audio. (See, that carrier was sort of doing something all along, by acting as a kind of "reference" signal!) To recover the original signal, it is necessary to reintroduce a fake carrier signal. Mixing it with the SSB signal results in a signal which is just like regular AM, except that one sideband is missing. Luckily, that doesn't matter, and the resultant signal can be processed just like any AM signal.

Transmitting without a carrier signal causes some interesting side effects. For one, interfering stations do not cause "heterodynes," or whistling tones, in the receiver because there are no carriers to mix with each other. Also, an effect called "selective fading," wherein atmospheric fading affects the two sidebands by different amounts (and causes terrible distortion) is eliminated, because there is only one sideband. You know how AM shortwave broadcast stations get that horrible distortion as they fade in and out? You won't hear it on SSB.

Another effect: The pitch of the voice changes as you tune across an SSB station because your fake carrier, which is the pitch reference, does not change with your tuning. For this reason, SSB receivers need great frequency stability, and are unsuitable for music, which requires very accurate pitch detection.

Finally, the best effect is that an SSB signal is much louder than an equivalent-power AM signal would be, because all the power represents your message.

Tradition

If you've operated HF SSB, you've noticed that we use USB on 20 meters and up, and LSB on 40 meters and down. Why? What could the frequency have to do with which sideband we use? In fact, why not just use one sideband all the time?

The answer is that you're right! The frequency has nothing to do with the chosen sideband. Radio, however, is evolutionary. At one time, components were expensive and radio designers tried to get as much functionality from as few parts as possible. One popular multiband scheme saved the cost of several crystals but had the side effect that the sidebands got reversed on 40 and 75 meters. So many radios were made that way that it became conventional to use those sidebands on those bands. Heck, you had to because everyone else did! So, even though today's rigs can switch sidebands with ease, we continue to use the old scheme out of tradition and habit. In some countries, sideband selections are mandated by law, but not here in the good old U.S.A.

By the way, although the telephone company had been using it over landlines, hams were the first to successfully apply SSB to radio transmission, which was more difficult. Eventually, they convinced the military to try it in airplanes. Not wanting to spend lots of money for the test, the armed forces took ham gear and modified it to their own frequencies. It was a great success, and today SSB is the primary mode in military aircraft. See, we hams *are* good for something besides putting wavy lines on the neighbors' TV sets!

Well, we've lots more to discuss; we haven't even touched on FM! But I'm out of room for this month, so we'll continue this next time. 'Till then, 73 from KB1UM. RF

Contact Michael Geier KB1UM care of Radio Fun, *Forest Rd., Hancock NH 03449.*

Quarter-Wave Whip for Your HT

by D.R. Kubichek N6JSX

This quarter-wave whip antenna is a viable alternative to a rubber ducky. It is slim, durable, lightweight, and inexpensive.

Construction Details

File or grind one end of a brass welding rod back about 1/4" to reduce its diameter so that the end can be securely put into the end hole of the BNC center pin connector.

Solder the end pin to the brass rod.

Slide about 1-1/2" of 3/32"-diameter heat-shrink tubing over the rod so that it covers the solder on the BNC center pin. Shrink the tubing using a match, lighter, or heat gun.

Slide about 1" of 1/8"-diameter heat-shrink tubing over the 3/16" tubing and shrink in place.

Place the rod assembly into the BNC housing.

Slide a 2" piece of 3/32"-diameter heat-shrink tubing over the rod and crimp the end of the BNC connector. Shrink the tubing.

Measure from the crimped end of the BNC connector to the desired length for the band of operation. If you measure carefully, you should have an antenna resonant on the band of your choice.

SWR Adjustment

If you have an SWR bridge, you may want to fine-tune your antenna length for the best SWR reading (measure at the low end of the band). If the SWR is too high, just cut off in 1/16" pieces and take another measurement.

Since there are no ground-plane radials, you probably won't achieve a perfect match. Just cut off the excess rod until you get a *minimum* reading.

Round the tip of the rod with a file. You may want to add an inch or so of heat-shrink tubing to the end of the whip as well.

table 1. parts needed

BNC connector, crimp type, 3-piece

Brass welding rod 3/32"

Heat-shrink tubing 3/32", 1/8", 3/16"

Note: Any welding supply house and some hardware stores should have brass welding rods available.

table 2. rod dimensions

Frequency	Length
146 MHz	19.2"
222 MHz	12.6"
442 MHz	6.3"
1280 MHz	2.2"

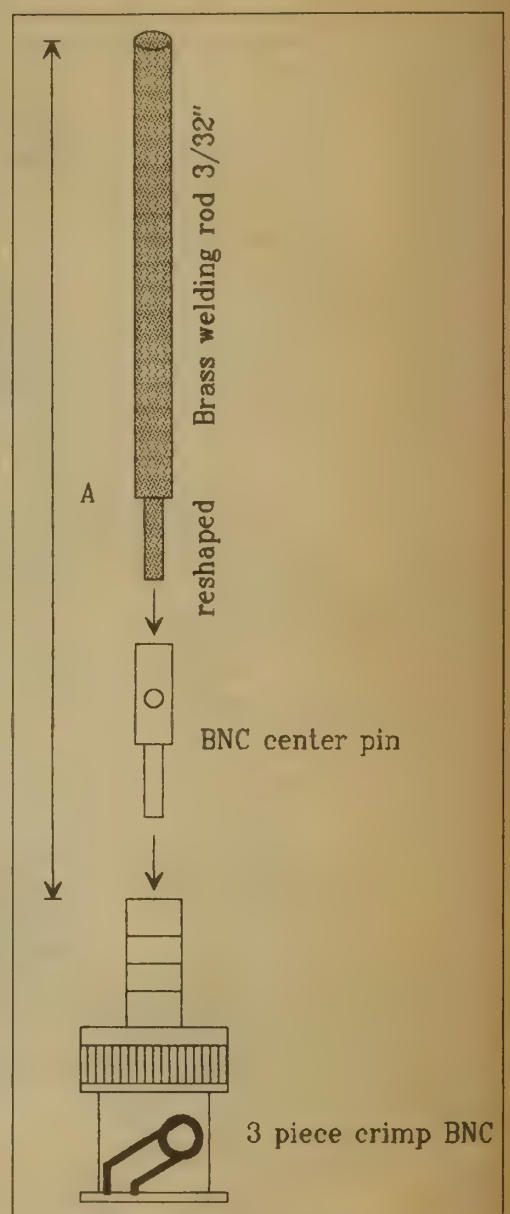


Figure. Assembly details for the quarter-wave HT whip.

Whip Your HT into Shape

You'll find that this whip antenna will perform better than a rubber duck. It should give you an extra boost when out in your repeater's fringe coverage area. In areas where I could just barely hear the repeater with my rubber duck, I now have good reception and can even access the machine. RF

Dale R. Kubichek N6JSX, Kuby Kommunications 19254 Tranbarger St., Rowland Heights CA 91748; 964-1188.

Operating OSCAR-13

From Jim KK3K, Philadelphia PA via Lambda Net News: I have so much fun with my satellite station that it is literally on (computer tracking program booted while I listen to the downlink passband) all the time when I'm home. The guys on the bird are like a club. There's a DX "clan," an unofficial net and an unofficial DX alert frequency of 145.890. You can check in and chat with the "regulars" or get QSL and "who's going to be on and when" info.

There's another group that hangs out on 145.94. The resident gurus of OSCAR-13 include John Fail KL7GRF, the DX king who can be found on 145.890, and Rex G4JUJ from England who is usually on 145.94. They're *always* on the bird. They've invested much time, effort, and money into their stations because their signals are the best. They're always willing to help out with technical advice and recommendations, or just rag-chew about DX or satellites. They're all friendly and great cut-ups.

I mainly listen in or ask for info and then work my own stateside and DX on other frequencies. It is a totally different world from HF. You get to hear and talk to familiar voices from around the world. For example, I've made three contacts in the Phillippines over the past year, all of them with the same operator. So you can get to know folks and have meaningful and multiple conversations.

Repeater Etiquette

by Alan Glasser NY2G

Often a new ham (or even an old ham) may develop bad habits and bad operating procedures only because of a lack of knowledge of proper procedures. This guide to repeater etiquette gives the conscientious repeater user some basic guidelines.

Before You Key the Mike

When first turning on your radio, listen to the frequency for at least 15–30 seconds before you transmit.

Speak into your microphone at a normal voice level. Don't mumble, ramble, slur, chew food or burp while talking.

Key your microphone before you speak and unkey it after you finish speaking.

If A Conversation Is In Progress

Don't break into the middle of the conversation if you have to make a call to another station or want to join the conversation. Wait (at least) until the thought in progress is completed and then announce your callsign. Do so by allowing the talking station to unkey the mike, and then make a quick call before the repeater "beeps" its courtesy tone or drops its squelch tail.

Identifying a station with "Break," "Call please," "Quickie," "Comment," or any other such words without station identification is not an acceptable form of identification, and those stations should not be acknowledged. However, "I have a comment, KX2ABC" is acceptable.

You don't have to identify after each transmission—just once every 10 minutes, or at the end of the communication before you go off the air. If you think a new station coming on frequency doesn't know who you are, as a courtesy you can give your name and call. You do not have to identify any other station, only your own, but if you do, your identification (callsign) comes at the end of your transmission, e.g., "KZ3DEF and the group (or you can mention all callsigns in the group), this is KX2ABC."

The station that is to get the frequency next is the only station that should acknowledge the breaking station (a station breaking into an existing conversation). The reason for this is that the next station to get the frequency was supposed to talk next anyway, so why not let that station handle the breaking station?

Even if the breaking station is your best friend, if it's not your turn, don't say, "Hello, Seymour. How are you?" Wait until it's your turn.

Stations hearing another station calling have two choices: Acknowledge that you heard the calling station ("KX2ABC recognized.") and give the frequency to the station at the end of your conversation, or, if you have nothing important to say, give the frequency immediately to the calling station.

A station that is given the frequency after identifying can join the conversation in progress, and then give it back to the station that gave it to him; or he can give it to the next station in a group discussion if he knows who gets it next. It is poor operating practice to throw the frequency up in the air for grabs.

If a breaking station is given the frequency to make a call, and if the call is not acknowledged, the breaking station should give it back to the station that gave it to him.

If a breaking station is given the frequency to make a call and the called station is contacted, the conversation should be brief, or both stations should move to an unused frequency, unless the station(s) originally talking on the frequency say it's okay to stay.

If you are in the middle of a long recitation and have to unkey the microphone in order not to time out the repeater, leave some room in case a breaking station has to make a transmission. Remember, a repeater is a very valuable asset to mobile stations who might have emergency traffic.

Leave some room after the courtesy beep or squelch tail has dropped to allow another station to break in if necessary.

Do not make comments or remarks during someone else's discussion.

Do not try to transmit over another station (called doubling). First of all, it's illegal; and second, nobody wins, since in most cases neither station can be understood.

If you think you are possibly doubling with another station, unkey your mike for a few seconds and listen.

If the repeater is being controlled by one station, such as the weekly check-in net or a technical net, stations given a chance to talk should always give the frequency back to the net control station unless the net control station instructs them otherwise.

Emergency Traffic

If you are reporting an accident or other emergency traffic, the police department wants at least the following information: nature of the emergency, e.g. "Vehicle on fire."; location, including cross streets or mile markers (especially on a highway), e.g. "Belt Parkway eastbound, 100 yards past West Street exit."; description of vehicle(s), e.g. "White station wagon in the left lane."; any injuries, e.g. "Possible injuries."

When you are reporting (originating) emergency traffic (such as a mobile accident) to another station, make sure you stay on frequency in case the station handling (passing) the traffic has to furnish the responding agency (police, fire, etc.) with additional information.

If you are a mobile station passing emergency traffic directly through the repeater autopatch, let the emergency operator know that you are a MOBILE AMATEUR RADIO OPERATOR. If you are a base station passing emergency traffic, let the emergency operator know up front that you are an AMATEUR RADIO OPERATOR in communication with a mobile station. Emergency 911 operators should have been visited by members of the ham radio community and should know who we are. Could be a nice club project!

The Proper Lingo

"Q" signals were not designed for phone conversations, strictly for code. However, "Q" signals are finding their way into everyday phone conversations. You should know some of them; they were on the test. QSL?

Don't use 11 meter ("10-4 good buddy . . . "), military, police ("K"), or other terms not indigenous to the HAM bands.

To CQ or not to CQ, that is the question. While the most popular way of indicating that you are available for a conversation (QSO) is to announce that you're "listening" and waiting for another station to call you. I prefer to call CQ and make my intentions known—that I want to have a conversation. While this raises some eyebrows, I always find a station to talk to (even if they comment about me calling CQ).

The word(s) BREAK (not to be confused with a breaking station), BREAK BREAK, or BREAK BREAK BREAK, are reserved for emergency traffic. Any station in communication on frequency hearing the word BREAK should give the frequency to the breaking station. BREAK should not be used for breaking into a conversation just so you can get a turn to talk. (This might be an exception in certain parts of the country. Check with your local repeater users for advice.) "Break" is a term mostly found on 11 meters.

Remember: Amateur radio is a hobby! You can have fun on the repeater! You even can joke around! But keep it sensible! RF

Contact Alan Glasser NY2G at 2133 66th Street, Brooklyn NY 11204.

New Convert

by Mary Vaughn N5VGB

The words "amateur radio" became part of my vocabulary when I met my husband, Bruce W5HTX, forty-five years ago. When Bruce and I married and moved into our first apartment, I inherited Bruce's grandmother's antique feather bed and his amateur radio station. On one side of the bedroom was the feather bed, large and comfortable, and on the other side, occupying an entire wall, floor to ceiling, was the amateur radio station. It was a home-brew station, the results of three years of planning while Bruce was in the Air Force. He was very proud of his creation.

Early in our marriage I became accustomed to being awakened at 3 a.m. by the sound of a keying relay solidly attached to a metal chassis, and by the eerie glow of flashing blue light from mercury vapor rectifiers. About this time I first heard the term "long skip."

Many long skips later, we purchased a house. The rig was moved into a shack off the back porch, where it remained until our boys graduated from college and moved away from home. Their large upstairs bedroom above ours became the new ham shack.

I am still awakened at 3 a.m. when the DX is rolling in. The distinct sound of Morse code, coming from the room above, is a friendly sound; a sound that tells me all is right in my world.

After 43 years as the XYL of W5HTX, now NR5Q, I thought I knew all there was to know about ham radio. Now that I am about to become known by my own call letters rather than as Bruce's XYL, I find that I lived in a world of blissful ignorance.

Something Old, But New

Oh, I knew many of the terms used in amateur radio. I was familiar with the words QSO, short skip, sunspots, antenna garden, rare DX, Field Day, hamfests, elmers, and the local DX net. However, I knew very little about the pleasure and satisfaction derived from ham radio. After all, I was the typical ham widow.

Then my husband was appointed education chairman of our local ARC. The club teaches classes twice yearly for anyone interested in amateur radio. Classes are conducted at the local Vocational Technical School. Bruce told me about the next class that was forming, and he just happened to mention that it would prepare students for the new no-code Technician license as well as for the Novice license. He planned to teach theory and operating procedure; a good friend, N5NXH, would teach code.

Somewhere during the discussion I made a commitment to take the course. How this came about is still unclear. At the first meeting I learned that there were a number of XYLs in the class. During our break, after being overwhelmed with what we had undertaken, each of us confessed that she did not know what had prompted her to attend the class.

To my amazement, I really enjoyed the class. It became a challenge. Even though it had been years since I had taken a test, with the help of my elmer I slowly began to gain confidence in myself. I actually began to understand the meaning of terms that I had always thought of as "ham jargon." Then something wonderful happened! I became interested and enthusiastic. I had discovered the world of ham radio.

We XYLs in the class gave support and encouragement to each other. When one of us became discouraged, the others urged her to continue. We have chosen different directions to reach our common goal. Our progress has been good. Even those of us working for our no-code Tech license are now studying code. We have one newly licensed ham, N5WEX; one XYL awaiting her Novice call and studying for her Tech exam; one no-code Tech waiting for her call; and two XYLs awaiting the next VE examination.

My elmer encouraged me to take my Technician examination during our local hamfest. Though he knew I was not ready, he felt it might help me to overcome my fear of the exam. The club had expected about 25 candidates to test for their licenses, and they had one team of VEs present. The test was to start at 1 p.m. When I arrived shortly before one, the break room of our local Vo-Tech School was full. The club quickly called in a second VE team to help. They tested 69 candidates that day.

I was finally admitted into the testing room at 4:30 p.m. I passed my Novice exam but failed my Tech by one question. It was a traumatic experience. I was tired, washed out, and had a splitting headache. I came very close to quitting. My elmer pulled me through, though. He said I was made of stronger stuff.

After a good night's sleep, I assessed my situation. I wanted my ham license! All I had to do was apply myself and use every study aid available to me. I had good teachers. I had my book *Now You're Talking*, the ARRL Technician License Manual, and both the Novice and Tech programs in my computer. I had my elmer. I couldn't fail. I was confident that I would be ready to take my exam at Ham-Com '91 in Texas that June.

Never Give Up!

When we arrived at the Arlington Convention Center, I went directly to the room where Novice and Technician examinations were being conducted. There were already a number of candidates waiting to take their exams. The room soon filled, and the overflow was moved into another area.

Although everyone knew that the new no-code Technician licenses would generate interest, no one was prepared for the numbers. Along with the newcomers interested in digital communications were the XYLs and YLs who had been waiting for this opportunity to enter amateur radio.

One examiner told me I had passed, only missing one question. From out of the past came an emotion I had not experienced since I was a high school senior in Tulsa, Oklahoma, in 1945. At that time all of our young men were being called into service, and women were replacing them in the job market. I applied, and was accepted, as an usher at the Ritz, the most prestigious theater in Tulsa. I left the theater walking on air. I was putting myself through high school and needed the money. This job would enable me to accomplish my goal. It was a terrific boost to my self-esteem, and I was very proud.

Perhaps I had started studying for my license because I knew my husband would be pleased, but my pride of accomplishment was for myself. Somewhere along the way, it had become a personal desire. I *wanted* to become a ham!

When I told Bruce that I had passed and would receive my call in a few weeks, the look on his face was the same as the look he gave me when I gave birth to our children. He was as proud as I was. Not only was he my husband; he was also my teacher and my elmer.

Dallas Ham-Com '91

Early Saturday morning, Ham-Com '91 was in full swing. We arrived at 8 a.m. The flea market was packed. Charles N5NXH and his XYL, Pat, were with us. Pat and I browsed through the flea market until the trade center opened.

Both Bruce and Charles enjoy building ham equipment. They were looking for parts. Pat and I had promised to pick up literature and freebies from dealers before we took the bus tour with other XYLs at 10 a.m.

When the trade center opened, hams packed the hall, wall to wall. Among the most active dealers were those who had a plentiful stock and attractive display of smaller HTs. I stood back, admiring them myself. When we could afford to, Bruce had promised to buy one for me to carry in my purse.

When Pat and I returned from our trip, we found the car loaded down with old radio parts. After Charles and Bruce rearranged the trunk of the car, we were able to get into the back seat. As we were driving back to our motel, Bruce reached into a sack and handed me an Alinco DJ-F1T transceiver.

XYLs Appreciate Gear, Too!

Years ago, Bruce gave me my first 400 watt power pack for a camera for Christmas. I opened the present and cried. The family did not understand. Was I happy or disappointed? They could not know how important that 8" x 12" x 6" blue box was to me. It was an expression of his faith in my ability as well as of his love.

Women like hardware, too! Women pursuing an avocation realize that a blue power pack or small black transceiver can shine as brightly as a diamond ring.

We are both anxious for me to make my first contact. When watching my OM engaged in a 35 wpm CW QSO, even though I only catch his call and a letter now and then, I understand the pleasure he gets from CW. I do not expect to become a high speed operator myself, but I intend to conquer the code nevertheless. I have a wonderful friend, WØAWP, who lives in Wichita, Kansas. He has been a ham since 1923. Al and I are both looking forward to our first contact with each other.

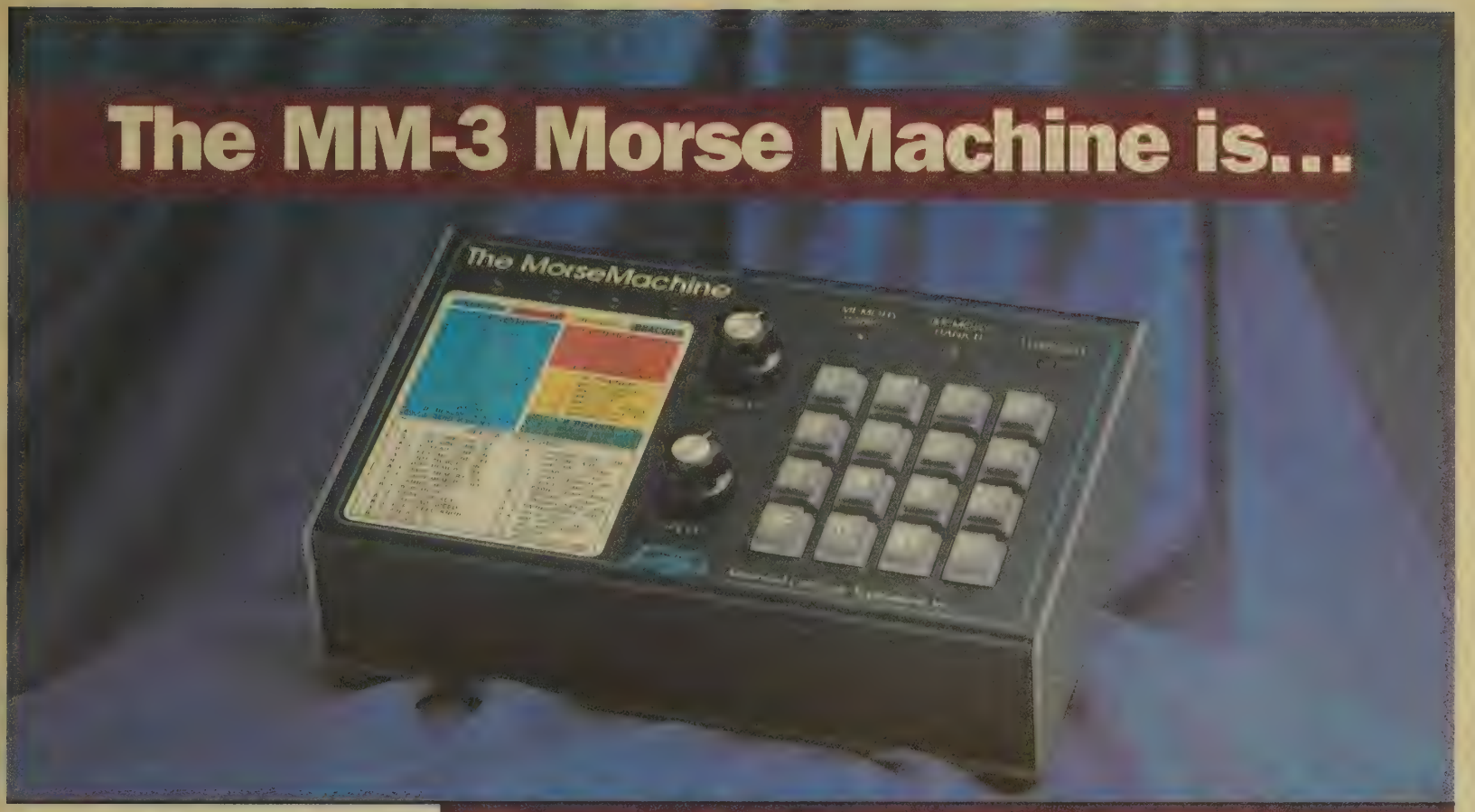
Bruce is a dyed-in-the-wool CW operator who loves to rag-chew with DX stations. I'm interested in packet and he is anxious to help me put a station on the air. I purchased the ARRL's *General Class License Manual* at Ham-Com '91, and have set a goal to upgrade my license this year. I am looking forward to making new friends and enjoying the pleasures of ham radio for the rest of my life. RF

Mary Vaughn, 504 Maple Drive, Sprinkle AR 72764.

Musical Morse

Kawa Records sent the editorial staff here a couple of their tapes, "Rhythm of the Code." As they claim, it gives a new twist to learning Morse code. If you like a beat you can dance or jog to, and you're having trouble learning the code, you might try it. Or you might give it to a young person as a fun way to learn code. See their ad in this issue of *Radio Fun*.

The MM-3 Morse Machine is...



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try something new

by Bill Brown WB8ELK

Public Service

How would you like to take an active part in the operation of a major public event? Wouldn't it be great to watch an airshow from the control tower, walk in the Rose Parade, sail in a yacht race or even fly in the Goodyear blimp? All these things are possible if you're willing to help out with amateur radio.

Marathons and running events, bicycle races, road rallies, parades and airshows are just a few of the events that your radio club or group could provide with communications. In any event that attracts a crowd, the major concern is that of public safety. In case of an emergency, it pays to have a communications network ready to respond to any eventuality. A quick response will certainly make a difference in a life-threatening situation.

Emergency Preparedness

Participation in this kind of an event will help you learn how to operate during an emergency communications net. You'll know just what to do to help out in a disaster. After all, emergency communications is one of the reasons that amateur radio exists in the first place! Not only that, you'll have the thrill of going behind the scenes at the event and may even end up as part of it.

Let's take a look at one such event that occurs annually in central New Hampshire.

The Warbirds Airshow

Every year during the third weekend of September over 30,000 people attend the Warbirds Airshow at the Manchester, New Hampshire, airport. This two-day event is sponsored by the New England Escradille (a group that specializes in restoring vintage military aircraft). Spectators get a chance to view the aircraft up close in the morning and watch them perform in the afternoon.

Any large event such as this requires quite an organizational scheme to keep things running smoothly (the amateur radio communications effort is no exception). John Keller NF1N has been doing an admirable job of organizing the ham radio communications during the last few years. Starting in May, he signs up recruits at hamfests, area radio clubs and via some of the local repeaters. This year over 58 amateur radio operators participated. Most of the 37 checkpoints were operational during a good part of the airshow. As an example of just a few of these positions, amateur radio operators were positioned with: the airshow announcer, the chairman and co-chairman, flight line safety, the FAA inspector, crowd control, the medical tent, handicap parking, and the airboss in the airport control tower. A number of these positions were actually operated mobile via golf carts as the airshow coordinators moved about.

John NF1N, Chris KA1SIE, Joel KC1SG and Dick N1FIL operated the net control station out of one of the hangars using the KC1HH 147.375 2 meter repeater that was located on the roof of one of the hangars. In addition, they cross-linked the 2 meter machine to 224.58 MHz via a remote in one of the vans in the parking lot so that the Novices could participate.

A Rough Landing!

Throughout the two days, the group was kept busy responding to handicap assistance at the parking lot, making sure that spectators didn't smoke near the fueling area and taking care of any medical problems that cropped up.

Of course, in an airshow the real danger is that of low-flying aircraft doing potentially hazardous acrobatics. During the late afternoon hours on Sunday, the weather started to deteriorate. As one of the AT-6 trainer aircraft landed,a gust of wind caused him to veer off of the runway. One of his landing gears collapsed and the plane spun around and nearly flipped over as it came to rest in the grass on the far side of the runway (see the sequence in Photo E). One wing was damaged, and the possibility of fuel leakage spelled a potentially disastrous situation (fortunately, the pilot was not hurt)!

This is just the kind of situation where it's invaluable to have an emergency network in place. Although everything was resolved safely, if there had been any danger to the spectators, amateur radio operators could have responded immediately.

How to Participate

If you'd like to get involved with an event, start out at your local radio club and see what kind of activities they cover. If there is a public event that you think would be helped out by amateur radio, bring it up at your club or just talk about it on the local repeaters. You may even be able to organize your own effort. Not only will your group have a great time, they will also have a great way to demonstrate amateur radio to the community. It may just be all that's needed to recruit a few new hams.

If would like to participate in next year's Warbirds Airshow in New Hampshire, drop a line to John Keller NF1N at 7 Bryant Rd., Nashua NH 03062. RF

Photo A. Mission control at the Warbirds Airshow. (l to r): John NF1N, Chris KA1SIE, Lisa N1KDQ and Andy KA1ZFQ.

Photo B. Critch N1ASZ and John NF1N man a checkpoint near one of the WWII bombers.

Photo C. Communicating with mission control from the flight line area.

Photo D. Golf-cart mobile at the spectator viewing area.

Photo E. An AT-6 trainer makes a rough landing after veering off of the runway. Photo sequence by Charles R. Cole.

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by Bill Brown WB8ELK

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Building Global Friendships

Encouraging Soviet hams in digital modes.

by David Larsen KK4WW, John Douglas NØISL, and Bob Friebertshauser W6YMR

Photo A. FAIRS Executive Director David Larsen KK4WW, on the right, presents a TNC donated by PacComm to Vasilij Bondarenko UV3BW, Chief of the Krenkel Central Radio Club, for use at UK3F Moscow.

"Building Global Friendships" is the purpose of FAIRS (the Foundation for Amateur International Radio Service). FAIRS members hope that goodwill can be created between our nations and fellow radio amateurs by providing training, equipment, volunteers, exchange visits, as well as other forms of assistance.

We feel that radio amateurs can really make a difference in the world we live in by using the common bond hams have for each other to develop friendships and break through international barriers.

During October of 1990 two of us, David KK4WW and Gaynell Larsen, made our first visit to the U.S.S.R. That first trip had seemed the high point of my teaching and hamming experiences. We had combined a seminar on computer automation at Lvov Polytechnic Institute with a chance to operate ham radio stations in both Lvov in the Ukraine and Moscow. By May 1991, we had organized a return visit to establish the very first HF digital emergency radio network in the Soviet Union. We were looking forward to visiting the friends we had made during this past visit.

We were able to share this second trip with John Douglas NØISL from Minnesota, and Bob W6YMR and his wife Virginia from Tennessee. John joined the trip to assist with a seminar and to meet in person Ukrainian and Russian hams who he knows from the airways. Bob and Virginia were on a combined rotary, missionary, and ham trip to help organize projects in these areas in the U.S.S.R.

Logistics

In addition to the mountain of personal luggage, which also contained gifts and teaching materials, there was almost half a ton of ham radio (TNCs, HTs, as well as HF and VHF transceivers) and computer equipment to aid in setting up a digital network within the U.S.S.R. This project was being coordinated by Victor Goncharsky UB5WE/KC1VF in Lvov, who received the support of the Radio Sports Federation (RSF) after I wrote to Mikhail Gorbachev, President of the U.S.S.R., providing information on this project and requesting support. President Gorbachev responded by sending a letter to Mr. Yuri Zubarev, President of the RSF. Mr. Zubarev indicated that the RSF would be glad to help make arrangements for the shipment and delivery of this equipment.

Photo B. John Douglas NØISL (seated), operating from U5WF in Lvov. Standing, left to right, are Victor Goncharsky UB5WE/KC1VF, Helen Goncharsky RB5WA, and Victor's dad, Vlad Goncharsky U5WF.

The paperwork required to bring this much equipment and material into the country seemed endless, as bureaucracy in Eastern Europe is a well-developed science. But after we received the formal acknowledgment from RSF President Mr. Yuri Zubarev, this barrier disappeared and all the transportation and customs clearances fell in place. The paperwork was not all Soviet, as the materials also had to be approved by the U.S. Department of Commerce, Office of Technology, and Policy Analysis. But, to their credit, the U.S. officials were helpful, and expedited all of our requests.

One week before our departure, all the computer equipment was sent to Aeroflot Airlines in New York, to be sent on to Moscow. The first authorization was for only 200 kilograms, but after many phone calls, Aeroflot received authorization to ship an additional 280 kilograms. There is a lot of bureaucracy to go through in getting these events to happen, and persistent effort is required by all involved. Victor and his group did get the equipment, but without the help of the RSF it would not have been possible.

Out of four groups wanting to sponsor us, we accepted invitations from Lvov Polytechnic Institute in Lvov, and Ulyanovsk Polytechnic Institute in Ulyanovsk. TECOP, a private enterprise, co-sponsored the Lvov part of our trip. We planned to teach a four-day microcomputer seminar as well as two half-day round-table discussions on the use of computers in science and economics. With the official invitations, we were able to obtain visas in about 10 days.

A call to Radio Sport made it possible for us to use our own callsigns portable in the U.S.S.R. Victor arranged for us to have a host station in each city, and coordinated this request with RSF.

From Moscow to Lvov

We arrived in Moscow on May 10, and were met at the airport by a delegation from Lvov, Ukraine, including our Soviet host, Victor Goncharsky. Others were Eugene Kaminsky, a professor at Lvov Polytechnic Institute; Yuri Katyutin UA4LCQ, of the Ulyanovsk Polytechnic Institute; Val Kudryavtev UA4LM; two other sponsors from Ulyanovsk, Russia; and our good friend Vladimir Stolmov from Moscow. Such a welcoming committee is even more impressive when you know that Lvov is a 24-hour trip, and Ulyanovsk a 10-hour trip, by train from Moscow.

Victor, Eugene, and the five of us Americans departed that night by train for Lvov. As we passed through each city, Victor pointed out the antennas of hams. We also saw the antenna farm of Radio Moscow, an ugly array fed by enough power lines to light a small city. About 12 hams and some other people met us at the train station in Lvov, and generously helped us with our bags.

Lvov is a beautiful city of about 900,000 people in the western Ukraine. The architecture reflects a Western influence, as Lvov has also been a part of Austria and Poland. The open green areas and many lakes almost seemed like home to John, who lives in Minnesota.

The next day, we had a wonderful visit at the home of Victor's father, Vlad Goncharsky U5WF. Victor's wife, Helen RB5WA, prepared a delicious Ukrainian meal. The hamming started soon afterwards, and continued every day as we had time. The three of us made about 4,000 contacts during our visit. John and Dave worked DXCC from Vlad's station during our 12 days there.

Making Friends and Agreements

Our official work started on Monday, May 12, at the Lvov Polytechnic Institute (LPI). Eugene Kaminsky was responsible for arranging sponsorship by LPI and TECOP, and Dr. Savenko Serge, another professor at LPI, was responsible for many of our activities and planning. In addition to the workshop and round table, we had many meetings with the president of LPI and other officials. I signed a protocol exchange agreement between LPI and the Virginia Polytechnic Institute (VPI), where I have been a faculty member for 24 years. The agreement was for teaching, student exchange, and research. We also had many meetings with various officials of private and government enterprises, as they were most interested in learning about how we do things here in the U.S. They want to join with Western activities as soon as they can.

After completing our official duties, we were able to spend all our time on ham activities. We spent most of our time with Victor and his dad Vlad, assembling the first 2 meter ham repeater in the Ukraine. The computers did not arrive in Moscow when we did, so we only had our personal equipment—four HTs, three VHF transceivers (in kit form, as assembled units could not be brought into the country), an ICOM IC-735 for UB5WE, and an IC-720 for UB5WCV.

We also had two hard drives for Victor's computer, which made it possible for him to get the APLINK station on the air, as well as nine TNCs and one AEA PK-232. We'd been informed that connectors were difficult to obtain, so we had several pounds of coax, RS-232, phone jacks, and plugs with us. Victor and Vlad had every piece of equipment operational before we departed Lvov for Ulyanovsk, Russia. Victor even installed one of the hard disk drives at about 3 a.m. He was up all night—like a kid in the candy store, as we would say.

John spent much of his time with ham activities, operating from stations U5WF, UY5XE, UB5WCV, and Lvov club station UB4WZA. He also participated in a fox hunt with Helen RB5WA. Also, during our stay, Helen gave up a weekend to represent the Soviet Union in the 80 meter QRP contest held in Bulgaria. We all appreciated that. She was an XYL winner for the Soviet Union in that contest last year.

Fox hunting, or hidden transmitter hunting, is a major sport throughout the Soviet Union. The Soviet military

Photo C. At Ulyanovsk Polytechnic Institute: Dr. Vyacheslav, A. Sergeev, Vice-Rector UPI, Gaynell Larsen (callsign on way), Virginia Friebertshauser, Dr. Sergei V. Skvortzov, Chief of Research UPI, and Bob Friebertshauser W6YMR. (That's NØISL behind Dr. Sergeev.)

provides a great deal of support for this event. Contestants, each carrying a hand-held directional antenna, compete in three trials: on 80 meters, 10 meters, and 2 meters. Typically, five transmitters are hidden in the area. Each of these transmit for one minute out of five. These transmitters must be located in order, and often cover 20 kilometers. Some competitions are as long as 26 miles.

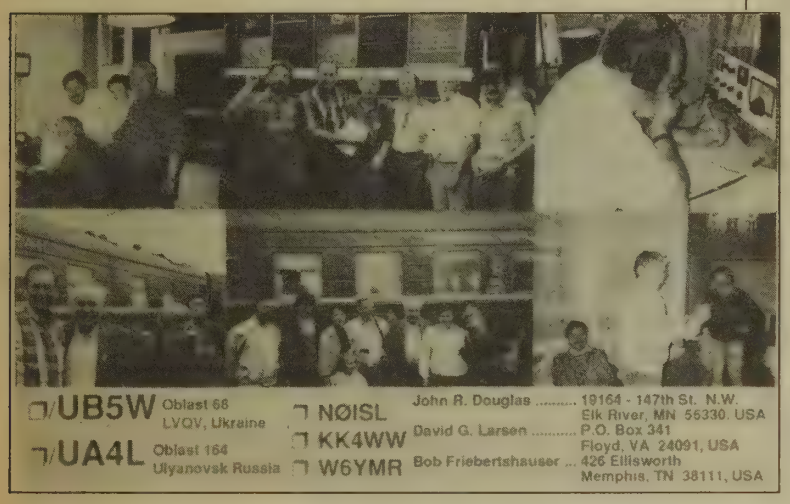


Photo E. The QSL card commemorating the FAIRS visit to the Soviet Union.

Victor was a wonderful host, and kept all meetings on schedule. He also did all the translation for our group. We are all studying as hard as we can to learn the Russian language, but we'll always need help in translation from Victor.

One afternoon, Victor arranged for most of the hams of Lvov to meet us in the park. About 20 hams showed up to exchange QSLs and photos, and to just visit. It was a heartwarming experience to have all these folks show up just to meet and visit the Americans.

Our last night in Lvov, we had official signing of our logbooks. Vlad, Helen, and Victor confirmed our 4,000 contacts. The next day, at least 30 people came to see us off to Ulyanovsk by Aeroflot Airlines, and give us more gifts. We all had tears of happiness to have met so many kind and sharing people.

Ulyanovsk

When we arrived in Ulyanovsk at about 10 p.m., a group of people met us, including Yuri Katyutin UA4LCQ, research director of microwave physics, and Vyacheslav Sergeev, vice-rector of Ulyanovsk Polytechnic Institute (UPI). Victor traveled with us on the entire trip, and made sure all arrangements were ready well in advance.

Ulyanovsk, the town where Lenin was born and raised, is a beautiful city on the Volga River. We were treated to a river cruise where the Volga is 10 miles wide. The next morning, the celebration of the 343rd year of Ulyanovsk was in full progress, so there was much color, dancing in the streets, partying, and special events with folks in the traditional colorful Russian dress. Social activities of the evening included making Bob, John, and Dave full members of the Ulyanovsk Signal DX club.

The next day we visited the elementary school Lenin attended as a child. Yuri told us he had attended this school, too. The young students were most interested in seeing Americans. The rest of the day, we visited the faculty at UPI and conducted the half-day round-table discussion. About 25 people attended, and everyone was awarded Virginia Tech certificates of attendance. We were informed that we were the first Americans to lecture at UPI. We presented a variety of computer textbooks to Vice-Rector Vyacheslav Sergeev for use by the faculty. They were very much appreciated.

Photo D. John Douglas NØISL receives trophy for first American to work DXCC from the Ukraine. Left to right: Victor UB5WE/KC1VF, John NØISL, George Chlijanc UY5XE, and Helen RB5WA

We were given a tour of some of the research laboratories, then began work on an exchange agreement between UPI and Virginia Tech. Yuri informed us that they planned to install a ham station at UPI. Victor once again provided his superb translating talents for all our activities. Without his help, the trip just would not have been possible.

That evening, John took time for ham contacts at the station of Valentin Kudryavtev UA4LM.

As usual, we had a big group to bid us farewell upon departure. Yuri joined us for the overnight trip to Moscow.

Radio Sport Federation

Back in Moscow, Vladimir drove us to visit with the RSF. We had no idea what to expect. It turned out to be a very productive meeting with Vasilij Bondarenko UV3BW, chief of the Central Radio Club; Nikolai Kazasnskij UA3AF, vice-president of the RSF; Vera Sveridova, chief of Box 88 QSL bureau; and other staff members. We thanked the RSF for helping to arrange transportation of the equipment for Victor's group.

We encouraged the view that Soviet amateurs be allowed to use digital modes at lower levels of licensing. At present, only the very highest class license holder can use any digital modes. We explained that in the U.S., our no-code Technician has full digital privileges above 50 MHz. Mr. Bondarenko expressed much interest in this. We also encouraged maximum efforts to have the third party and reciprocal licensing agreement with the U.S. approved. These documents had already been fully approved by our State Department; they are just waiting for the approval of the Ministries of

Communication and Foreign Affairs in Moscow.

A TNC donated by PacComm and an IBM clone computer were delivered to UK3F while we were there. Then a Moscow TV news team showed up, and filmed our visit for the 6 p.m. news. We were able to get our own video directly off Vladimir's TV with John's camcorder. Mr. Bondarenko gave us some very nice gifts to remember our visit to the Central Radio Club.

Later that day, we met with Editor-in-Chief Anatoly Gorokhovsky of *Radio Magazine*. We discussed his publication, and submitted an article by Dick Anderson W4OLD about the original Radio Central on Long Island, New York. Then we met Vice-Editor Boris Stepanov UW3AX. He told us of their work with the Soviet cosmonauts, and in particular the leading role they play in training them for the ham activity on the *Mir*, the Soviet orbiting space station. On concluding our meeting, we delivered a TNC and IBM-clone computer to UK3R for their use in amateur emergency and space communications.

Full Speed Ahead

With all the changes that have taken place since August 19, it is not known what the future of amateur radio will be like in what was the U.S.S.R. Our feeling is that it will get better, particularly in dealing with emergency communication and the ability of FAIRS to bring equipment into the republics. The Radio Sport Federation will surely be much different. We will probably be dealing with each republic on a separate basis, which will require setting up new methods for shipping equipment and getting permission for these activities. It will be confusing for awhile, but in the long term, the hams will probably benefit in a positive way. We are in contact with our Soviet ham friends several times a week, and the attitude is "full speed ahead." FAIRS is proceeding with several projects with our U.S. and Soviet members.

As a result of this visit, and with an enormous amount of dedicated work by all Soviet FAIRS members, the Soviet Union now has a digital network. APLINK station U5WF (UBWF) operates on 14.075 MHz which ties into a network of seven VHF packet stations. In addition, two HF packet stations are now operational at the UK3F Krenkel Central Radio Club and at the UK3R club station at *Radio Magazine*.

We had many wonderful experiences at the homes of our hosts, their families, and new friends. Thanks to amateur radio, we can keep our friendship renewed often. RF

About FAIRS

The purpose of FAIRS, the Foundation for Amateur International Radio Service, is "Building Global Friendships" between peoples and nations. This goodwill is created by providing training, equipment, volunteers, exchange visits, and other forms of assistance FAIRS members are able to provide.

Radio amateurs can really make a difference in the world we live in by using the common bond hams have for each other to develop friendships and goodwill in many ways. FAIRS is not limited to helping only amateurs, but any individual, group, or government. FAIRS only becomes involved in activities that have the highest personal and legal ethics.

FAIRS's first project was to help with equipment and training for the first HF digital emergency radio network in the Soviet Union. About half a ton of computers, TNCs, HTs, HF and VHF transceivers were made available by donations from many organizations and corporations. It was difficult to get this equipment into the U.S.S.R., but with assistance from the Radio Sport Federation in Moscow, the equipment was shipped on Soviet Aeroflot Airlines from New York to Moscow.

FAIRS Soviet operations director Victor Goncharsky UB5WE/KC1VF coordinated the Soviet activities of members David Larsen KK4WW, Gaynell Larsen, John Douglas NØISL, and Bob Friebertshauser W6YMR and his wife Virginia. On July 30, 1991, Victor reported that the visit by the U.S.A. FAIRS delegation, plus an enormous amount of dedicated work by all Soviet FAIRS members, resulted in an amateur packet 144 MHz network in Lvov, Ukraine, which now consists of seven stations. It has become the second largest station of its kind in the U.S.S.R., and is continuing to grow.

The first U.S.S.R. APLINK station was installed at U5WF in Lvov on July 15, 1991, giving the VHF packet users the ability to exchange messages with the outside world on shortwave.

The packet mailbox stations at the Krenkel Central Radio Club station UK3F and *Radio Magazine* station UK3R in Moscow were installed, accompanied by three HF packet stations in Ulyanovsk, Russia.

This digital HF/VHF network could and is actually used to pass all kinds of emergency messages. In addition, the very first 2 meter repeater in the Ukraine is operational in Lvov.

FAIRS founding members are KK4WW, NØISL, W6YMR, Gaynell Larsen, UB5WE, U5WF, RB5WA, UA4LM, UA4LCQ, UB5BPR, UB5WCV, and UY5XE.

You can be a part of this personally rewarding work by joining the organization, perhaps even representing FAIRS in some activities; you can help obtain needed equipment for projects, or make a contribution so others can carry on the work of FAIRS. For more information, contact David Larsen KK4WW, Director of Operations FAIRS, P.O. Box 341, Floyd VA 14091. Tel. (703) 745–4023 or (703) 382–9099.

what next?

by Carole Perry WB2MGP

Photo A. The Science Museum of Long Island is also an exciting educational institute.

Hamming It Up At The Museum

Several years ago I had the pleasure of meeting Michael Orofino W2KO at a local QCWA function. Both he and Bill KA2OVR have kept me up to date on the many wonderful events and achievements of Long Island, New York, ham radio clubs. The latest project these dedicated hams have gotten involved with is of special interest to me because it allows children the opportunity to learn about radio in a fun way.

Photo B. ERCC members raising money for the museum at a hamfest. Left to right are Mike W2KO, Ed W2KPQ, Herman W2TLC, Christine N2LXX, Kate AE2Z, Bill KA2OVR, Irv K2IRZ, and Milt W2ERJ.

A group of ham radio operators from Long Island have established an Electronic and Radio Communication Center at the Science Museum of Long Island. The museum, a 22-room mansion on 40 acres overlooking Manhasset Bay, is a non-profit organization. It offers consulting services to educators, staff development workshops, and hands-on training for teachers with limited science preparation.

The large house in which the Science Museum is located was built in 1906 by Robert Sizer, who was in the lumber business. He brought in all of the topsoil and plant material by barge. The grounds which are still quite beautiful were originally laid out by a landscape archictect. After Mr. Sizer passed away, the estate was purchased by Herman Goldman in 1927.

Mr. Goldman was the head of a well known marine law firm at 120 Broadway, and the brother of Albert J. Goldman, Postmaster of New York City for over 20 years. Mr. Goldman did considerable reconstruction and decorating on the mansion. After his death in 1968, Mr. Goldman's estate was purchased by Nassau County as part of its land bank to protect it from being divided up as a housing development.

In 1973, the Science Museum of Long Island was fortunate to conclude an arrangement with Nassau County to lease this building, with the County maintaining the grounds of the 36-acre Preserve and its access to Manhasset Bay, Leeds Pond, and the woods and the streams that meander through the property.

A Rich Educational Resource

This winter, a group from the museum, including the director, Dr. John Loret, will go on a research expedition to Patagonia, Argentina. The ERCC at the museum has an active amateur radio station and will be in constant communication with the expedition.

The Electronics and Radio Communication Center is now teaching ham radio and electronics to beginners in preparation for their Novice license. Its teaching staff will expand its program to teach with hands-on training, computers, satellite communication, packet radio, ATV, RTTY and other developments of the electronic age. The sights are set quite high for the expansion of the ERCC.

Photo C. Christine Kim N2LXX, a senior at Hofstra University, is the first in her class to receive her Novice license. She recently passed her General theory and will soon take her code test.

The museum presents 62 science programs to approximately 40,000 school children each year. On December 5, 1990, the radio group did a demonstration for 20 students and teachers who were attending classes at the museum that day. They made a wonderful contact with W5RRR, the amateur radio station at the NASA Johnson Space Center in Houston, Texas. The students, with Alex AI2Q at the microphone, loved the fact that they could ask questions about the *Columbia* shuttle which was in orbit at the time.

The "Antique Radio and Electronic Section," ERCC's recent addition, are on display to be viewed by the museum's many visitors. The group has received many donations of antique radios and telegraph keys. All the items

Continued on page 25

RF review

The Radio Shack VHF/UHF SWR-Power Meter

Radio Shack
700 One Tandy Center
Fort Worth TX 76102
(817) 390–3300

Price Class: $40

Larry R. Antonuk WB9RRT

Any ham who ventures off into the mysterious world of antennas soon finds that he needs an instrument capable of giving some indication of the health of his antenna system. You can measure continuity with a light bulb and a battery, but to really tell how sick your antenna is, you need a wattmeter. Not only can a wattmeter give an indication of the power level from your transmitter, it can also tell you how much power is coming back down from the antenna. This information can be quite useful during the antenna/transmission line troubleshooting process.

The problem with wattmeters is that accurate ones tend to be quite expensive. To combat this problem, hams back in the old days developed the VSWR bridge. A Voltage Standing Wave Ratio bridge does just what the name implies. It samples the voltage going to and coming from the antenna, and provides a ratio that indicates the status of the standing waves on the line. Ideally, you would like all of the transmitter's power to be going to the antenna, and none of it being reflected back down the line. This would be expressed as 35W out, zero reflected, or as a VSWR of 1:1. This is also called a flat antenna system.

The problem with VSWR bridges is that nowhere in the name does the meter claim to know anything about power. It just expresses a ratio of the forward and reflected power levels. Your VSWR meter can tell you that everything about your antenna system is just fine (and it will be correct), but it can't tell you that your 35W mobile is only putting out 2W. For that measurement you need a wattmeter. Wattmeters, by nature, are frequency-sensitive devices and are accurate only in the bands they were designed for. It's OK to use that old CB VSWR bridge to measure VSWR on two meters—since VSWR is a ratio, the unit will be equally inaccurate in both directions and you'll come out OK. Power readings, of course, will be way off the mark. You didn't really think your 2m HT was putting out 67W, did you???

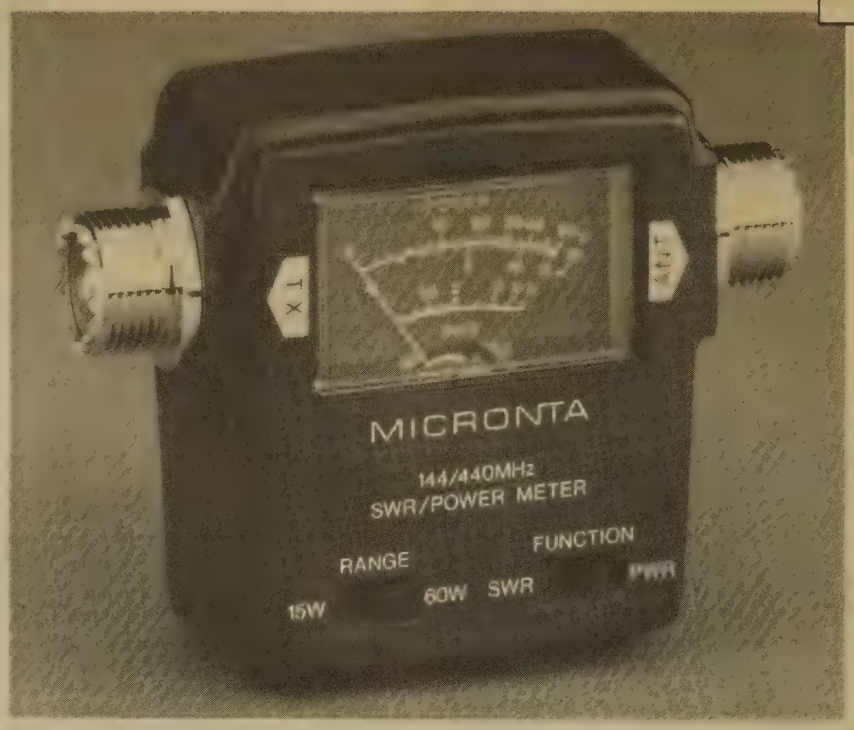


Photo A. The Radio Shack SWR/Power Meter.

You Do Need a Wattmeter

It's obvious, then, that you do need a wattmeter to get the full picture of your antenna system, especially at VHF and UHF. A new addition to the Radio Shack catalog this year is the 19-320 VHF/UHF SWR-Power Meter. This palm-sized meter measures power on 144 and 440 MHz, and provides SWR readings as well. The unit is constructed in a die-cast aluminum housing and has two female UHF-style connectors (SO-239's). Two switches on the front cover select the power range (15W or 60W) and the SWR or POWER mode.

Those hams familiar with the classic version of the VSWR meter will immediately notice something missing on the Radio Shack model—the SET control. In a standard meter, the SET control adjusts the forward power reading to a reference point, usually full-scale. The meter is then switched to the reverse reading element, and VSWR is displayed as a percentage of the full-scale forward power. Rather than displaying a percentage, the scale is usually calibrated in units that correspond to the SWR for a given power

ratio—1.1:1, 5:1, etc.

How does the Radio Shack meter work without this function? Instead of allowing you to calibrate the meter to whatever power level you happen to be using, the engineers at Radio Shack expect that you should adjust the power level of your transmitter to match the meter's SET level. Then, when you flip the switch to SWR, the meter will read a percentage of the recommended forward power (either 15 or 60W), and by reading the appropriate scale you can determine the SWR. This system works well, unless you're a QRP operator and only have a one watt transmitter to test your antennas with. In that case, you'll need to dig out that CB VSWR bridge that we discussed earlier. (There is a conversion chart on the back of the meter that lets you correct the SWR measurement for other power levels less than 60 but greater than 5W.) The decision to use a fixed VSWR SET level was most likely a trade-off for space—no adjustment pot means the unit can be that much smaller. This makes more sense in the long run, but some experimenters who have to have VSWR may need to calculate the VSWR from forward and reflected power readings.

specifications

Frequency Range	140 to 150 MHz, 430 to 450 MHz
Measurable Power	2 ranges: 0 to 15W or 0 to 60W
Insertion Loss	0.3 dB
Maximum SWR Measurement	Up to 5:1
Impedance	50 ohms
Dimensions	2-9/16″ x 2-1/4″ x 1-1/16″
Weight	5.3 oz.

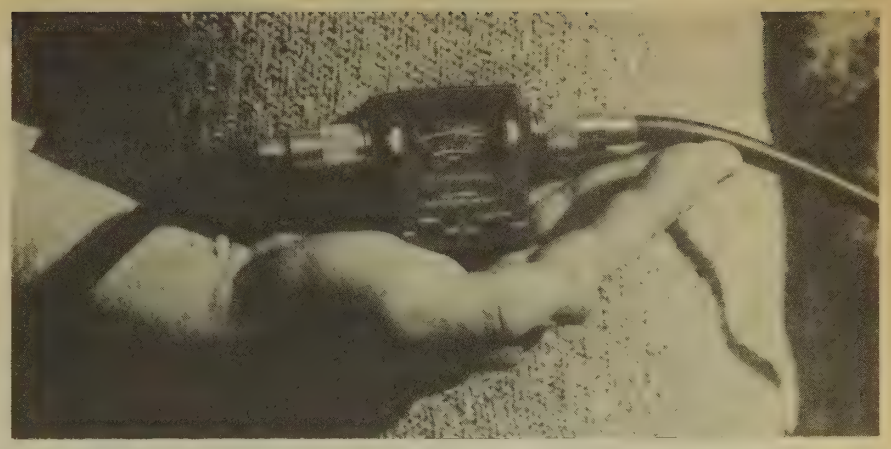


Photo B. The SWR/Power meter in action.

But Can I Trust It?

The major parameter of concern with any piece of test equipment is its accuracy. Is the reading that you see a true representation of the power in the circuit? If not, how far off can it be? In other words, what is the tolerance of the measurement?

I performed various tests comparing the Radio Shack power meter with a Bird wattmeter and a commercial communications monitor (traceable to a national standard) on both the 2m and 440 MHz bands. These tests showed that the Radio Shack meter indicated as much as 20% higher power levels than that shown by my lab standard meters. Although this might seem like a fairly large error, it really isn't bad at all when you consider the errors incurred by much more expensive power meters.

It might help to put the Radio Shack unit in perspective. To begin with, the small size of the unit limits the actual readability of the meter. The meter movement itself measures 1.5″ x 0.8″, and the scale is divided by a single hash mark between, say, the 30W and 40W points. Even accounting for this, it should be noted that most professional wattmeters aren't highly accurate, and very few are actually traceable to a national standard. (The classic in-line wattmeter that everyone wishes he had has an accuracy of ± 5% of the full scale reading.) Does this make the instrument useless? Of course not. What it means is that the instrument should be used in a relative rather than an absolute manner. As an example, you might measure the antenna system in your car after installing your new 440 MHz mobile. The SWR is quite good, but the unit is only putting out 40W, rather than the 45W that it's rated for. Rather than sending the mobile back to the factory for "low power," you need to adjust your thinking to compensate for the small inaccuracy in the meter. More importantly, you need to keep this reading in mind (or in a log) so that you can compare the reading with another taken six months later. If the later reading has dropped to 20W, you've got a problem. Likewise, a meter will allow you to compare two different transmitters and determine which one is putting out more power. Using the wattmeter in a relative mode and understanding the capabilities and limitations of the instrument will make it a valuable troubleshooting tool.

A Good Compromise

While the lack of a SET control and moderate accuracy may be of concern, these drawbacks are more than compensated for by the Radio Shack SWR-Power Meter's small size, quality construction and low cost. Its low insertion loss makes it a good candidate for a permanent position on the operating table (or dashboard), and its small size makes it likely to wind up in a toolbox or up a tower. Either way, the SWR-Power Meter is a very worthwhile investment. RF

upgrade... don't stop now!

by Gordon West WB6NOA

Books and Question Pool Changes

Thinking about upgrading your theory? If so, let's talk about the upcoming dates for changes in the amateur radio question pools.

Novice and Technician class question pools are officially called FCC Elements 2 and 3A—2 for the Novice, and 3A for the Technician. They haven't changed much over the last few years, and the next change won't be until the middle of 1993. So what you now have—or what you will probably soon get—is good for the next couple of years.

The General class question pool, called Element 3B, hasn't changed much except for one thing: Letter-number-letter combinations are now spelled out in exact words on the General test. In other words, old training materials may say "J3E," but on the exam the wording will be "single sideband suppressed carrier." You probably won't see a change in General class questions until 1994.

Advanced class questions, Element 4A, and Extra class questions, Element 4B, have barely changed any over the last couple of years. As with the General test, letter-number-letter combinations are spelled out. Instead of "A1A," it now reads "Morse Code" or "radiotelegraphy." Same thing, of course, with the Extra—FCC Element 4B. You probably won't see other changes in the Advanced and Extra class question pools until the end of 1994 or the early part of 1995.

This means that all the books you have been studying are right on target, and any materials you have purchased in the past five years ought to be good for a while yet.

Theory by the Tube

Studying the paperbacks is certainly a good way to prepare for an upgrade examination. But did you know that all of the question pools are on diskette, too?

Studying questions from a computer can be downright fun! First, let the computer build you a typical test for the particular element you are planning to upgrade to. Next, complete the test on the computer, and then check your score. You missed how many?

The computer then goes on to a new examination, but it might automatically include those questions you blew on your second test. Take the test, calculate your score, and then go on for another exam. All the while, your computer keeps track of your progress, and keeps hitting you with those examination questions you keep blowing.

If you really want to abuse yourself, ask the computer to give you only those questions which you have missed before. That's a quick way to get a handle on what you need to learn in order to prepare yourself for the upcoming test. Then, at the end of the day, call up your graphics and see for yourself, on-screen and in living color, your progressive march to excellence.

W5YI Software

One of the best self-testing pro-grams I have tried comes from Fred Maia, W5YI Publishing, P.O. Box 565101, Dallas TX 75356-5101 ([817] 461–6443).

Fred Maia W5YI and Steve Sternitzke NS5I have developed this $30 program that is available in both small or large disk format for the Novice, Tech, General, Advanced, and Extra question pools—and you get them all. Each disk includes every possible test question and the four multiple-choice answers for each question.

Photo A. With the right software, preparing for a ham test on the computer can be fun.

You can take the sample ham tests right at your IBM-compatible keyboard, on-screen, or you can print out the tests and take them on paper. After entering your answers into the computer, a prompt will tell you whether or not you got the answer correct. The computer tabulates your score both in numbers and percentage correct. The software also includes a copy of Part 97 so that you can review your rules and regulations.

This is the same type of software that Fred and Steve issue to their examination teams, so you are assured of getting the right stuff that will be covered on your exam. But nooooo, there's not a chance you'll ever get a sample exam that will be the same as your real exam. The number of different tests you can make from the questions in the question pool are myriad. But the *appearance* of the test will be the same!

If you just want to study the question pools on paper, you can order any individual question pool for $3.00 each, or receive the combined Novice and Technician question pools for the new no-code ticket for $4.95 each. These also come from the W5YI Publishing group.

The Lanz Company

The Lanz Company in Louisville, Kentucky, (502) 895–1377, also offers theory computer disks, as well as a video tape that contains all of the question pools on individual VCR tapes. Bob Lanz N4ISL is a regular hamfest attendee, and he wants to see as many new students upgrade on the computer as possible. All Lanz programs are compiled on stand-alone IBM PC-type disks, and documentation is also included on how to install the programs in a hard drive. He is also one of the few that offers programs for the Commodore 64 with compatible drive and monitors.

Diamond Systems

At Diamond Systems, Roger Wayman W9TYT offers question pool disks, but with a twist—he has narrated an explanation after some of

the more difficult questions. Similar to the Gordon West theory books and Ameco theory books, you see a question, the four possible answers, the right answer, and then AN EXPLANATION! Give Roger a call at (312) 763–1722, and he and his dad will tell you all about their brand new combined Novice and Technician theory diskette specifically for the new no-code license. He has so much information packed on one disk, all of the other upgrade disks must be purchased separately. The only thing not on the screen are the individual schematic diagrams and electronic component symbols. For these, you look at the accompanying paperwork, or consult your regular theory book.

QSO Tutor

QSO Tutor (Kennett Square, Pennsylvania; [215] 347–2109) is a colorful theory program, distributed by MFJ (Mississippi State, Mississippi, [601] 323–5869). This is probably the ultimate in colorful upgrade preparation on an IBM-type computer at about $30 for each individual element. You can work with the entire question pool, or select certain areas of the question pool, or automatically select those questions which you have missed before. There are plenty of graphics on the program—including full-screen schematic diagrams that others had to resort to paper to get down. This is what makes his program a little bit more expensive than the others—added graphics which took a long time to digitize and come up on the screen in living color. Of course, you could run the program in mono, too.

Originally the program was sold exclusively by QSO Tutor, but sharp-eyed Martin at MFJ spotted a terrific program in the making and took over distribution for this product. You might want to write MFJ for their new 1992 catalog, and be sure to check out their "upgrade" departments.

Updates

The question pool committee is presently working on Element 2 and Element 3A syllabi. It's the syllabi that provide the framework for the questions within an individual element. The question pool committee, made up of lead volunteer exam coordinators, will release the Element 2 updated syllabus on February 1, 1992. This will allow individual hams to have four months to submit questions within this framework to the Element 2 and Element 3A question pools.

On July 1 of next year, the question pool committee works on Element 2 and Element 3A questions, and releases these questions for final review on December 1st. On January 1, 1993, the question pool committee will furnish written copy of the new Novice and Technician element question pools, and disk-makers and publishers will begin to update their books by May 1st. On July 1, 1993, the new revised Novice and Technician written questions will go into effect, and there will be plenty of new questions and answers out there in public domain for everyone to get started for Novice or Technician.

So, if you are looking for a new way to prepare for your upgrade, do consider sitting in front of the tube. It's a lively way to prepare to pass the tests. RF

what next?

Continued from page 21

are displayed with the contributor's name.

Members from the Long Island QCWA Chapter 81 spearheaded the project with help from members of LIMARC, Nassau, and Suffolk radio clubs. The members of the ERCC Committee are Ed W2KPQ, Mike W2KO, Bill KA2OVR, Sid K2LJH, Alex AI2Q, Kate AE2Z, Milt W2ERJ, and Herman W2TLC. For additional information, contact the Science Museum of Long Island, Attn.: ERCC, 1526 N. Plandome Road, Manhasset NY 11030.

As a teacher myself of 6th, 7th and 8th graders, I am always on the lookout for new and exciting ways to present ham radio lessons. Taking youngsters to a hands-on museum like this one is an excellent way to excite the children's imaginations and stimulate excellent discussions. Ham radio instructors of children or adults should take advantage of local museums that can provide experiences that motivate learning. RF

Generous Hams

Continued from page 1

Without ever having met George personally, and without knowledge of the gift, Nick took the exam and passed with a 100% score. (I view this as an indication that George must have been helping him.) After passing the exam, the head examiner, Charles Roy WS6F informed Nick of the bequest.

When he went to take the test, Nick was firmly committed to never having anything to do with that awful Morse code. Before leaving the exam site, he announced that he would be back soon to take the code test.

Nick, his brother Tony KC6YSB, and I were all taken aback by this act of kindness from a person whom we never knew. Even so, we shall always remember him. We are also all committed to follow in George's footsteps and return to ham radio a portion of what it has given to us.

PR for Ham Radio

To maintain a favorable public image of hams and amateur radio, Joseph Phillips K8QOE, Public Information Coordinator of the *Ohio Section Journal*, gives a list of 10 items which would annually generate news stories in your local newspapers or radio and TV stations:

1. Ham of the year (selected by your club).
2. New officers elected for the year.
3. Field Day activities (prior to event).
4. Local hamfest or other social event.
5. Ham participation in local civic event (parade, marathons, bike-a-thons, etc.).
6. Local ham radio classes.
7. Unusual QSO or unusual QSL card received by a member (Don't write this one up as a press release. Call a reporter and sell the story.)
8. Local club president or PIO commenting on pending federal or local government legislation.
9. Field day statistics after the event.
10. Story about a ham speaking to local civic group or at a school activity.

Your ham radio activities could be covered by your local media just about every month! It takes effort, Phillips notes; you can't wait for reporters to call you. You have to generate your own stories for press releases. You need a PIO (Public Information Coordinator) in your club, and when he asks for help, he needs the cooperation of club members.

The public needs to know about amateur radio and what hams are doing. This will safeguard amateur radio's reputation when the occasional negative story is published, and when legislation threatens to reduce our privileges.

K8QOE notes that new laws passed to regulate electronic devices could affect amateur radio, and he gives Ohio House Bill 348 (intended to regulate commercial cellular towers in his state) as an example. The effect of such legislation on amateur radio will be more readily taken into account if the general public, including the lawmakers, are aware of the value of amateur radio as a public resource. TNX *NOARS LOG*, Oct. 1991. RF

radio magic

by Michael Bryce WB8VGE

How About Some Milliwatting?

When looking for gear, we sometimes stumble across QRP (low-power) transmitters. While the majority of hams don't talk on a transmitter of less than 200 watts input power, a few brave souls do just for the challenge. If you're up to it, and like to save a buck here and there, try QRPing!

Maybe it's for the challenge of doing things a bit differently from the rest of the crowd. Maybe it's the thrill of working DX with a transmitter you built from a handful of parts. Maybe it's just FUN! What are we talking about? QRP—the art of low-power communications.

As a "Q" signal, "QRP" was created to mean "Shall I reduce power?" Enthusiasts of low-power amateur radio operation adopted it, and after much debate, it came to mean "5 watts or less output on CW or 10 watts PEP output on SSB." Operating on power levels under 1 watt is called "milliwatting." This term replaces the older term "QRPp."

The QRP Advantage

The QRP operator uses equipment that weighs less, takes up less space, costs less, and is less dependent on commercial power. The QRP operator has freedom. This freedom makes it possible to carry a complete amateur radio station in the corner of a backpack. You can operate a QRP station from a pack of batteries carried in a shirt pocket for days; or you can operate indefinitely from hydroelectric, wind, or solar power systems. There are many QRP stations operating for Field Day with only one old car battery as the power source for a full 27 hours!

As an added bonus, TVI is pretty rare while running QRP. It would not bother me in the least to fire up the QRP rig during the Super Bowl. I know of not one single case where "quiet" hours have been imposed on a QRP operator because of TVI. Move the 2 kW amplifier to the floor and use it to keep your feet warm during the winter.

Good Start in Home-Brew Projects

Very few of us can sit down and build an ICOM IC-781 from scratch. QRP, on the other hand, is one of the few areas in amateur radio where the average ham home-brewer can still make a decent showing. In fact, you could go to the local Radio Shack right now and bring home enough parts to build an 80 meter CW transmitter. Even if you've never held a soldering iron before, building a QRP transmitter is a simple project.

Many QRP transmitters consist of a few transistors, coils, and standard resistors and capacitors; nothing more! Since most QRP operation is in the HF bands (80 through 10 meters), layout is not particularly critical. Since a fair amount of QRP operation takes place on certain frequencies, crystal control of the transmitter is not as bad as it sounds. Simple VXO circuits allow for moving the crystal's frequency around a bit. Many QRP projects use VFOs and offer full QSK to boot!

Now don't get the idea that running QRP means operating with inferior equipment! Nothing can be less true. Granted, you won't be able to cram an IC-781 into a matchbox, but that's not the idea. Receivers for QRP use are usually as good as the station receiver—sometimes better! There are limits as to how much performance you can expect from a receiver using minimal circuitry. The old saying, "You can't work 'em if you can't hear 'em," applies to QRP as well as DX. There are many hams who have worked DXCC running less power than a flashlight while having the time of their life.

Join the Club!

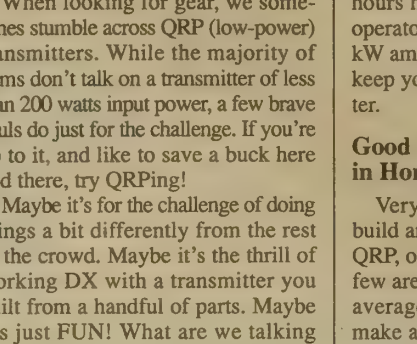
QRP provides the ham with an outstanding array of things to do and say. No matter if you're into nets, DX, contests, awards and home-brewing—they are all part of QRP.

Does all of this talk of QRP pique your interest? There are many clubs devoted to low-lower communication. The oldest is the QRP ARCI, with over 7,000 members. If you would like more information about joining the QRP ARCI, drop me a note (see my address at the end of this column). I'll send you a sample of *The QRP Quarterly* and membership forms. Once you're a member, it's for life. The only cost is for mailing *The Quarterly*.

Check around and you may come up with some bargains in low power equipment. Ten-Tec's Argonaut series transceivers (the 505, 509 and the 515) are excellent to use, even for the newcomer. A good receiver and ample RF power (for a QRP rig) will net you many a contact, with the least amount of dollar output.

Another good buy is the Heath's QRP rigs: the HW-7, -8, and -9. The HW-7 has the worst receiver of the trio, but it is usable. The HW-9 has the superhet receiver and will cover all the bands, provided the band kit was installed by the builder. Note, however, that the Heathkit rigs are no longer being made, and all were in kit form at one time. Look them over real closely before you plunk your money down on the table. And get the manuals! RF

You may contact Michael Bryce WB8VGE at 2225 Mayflower NW, Massillon, OH 44647.



Alice Coppock, KC6VYI—"Very Young Individual"—is a nine-year-old Technician with her sights on a General ticket and Worked All States Award. When not collecting states on 10 meters, she contacts her mom, KB6OGM, and dad, N9EPY/6, on her 2m HT. Alice also checks in regularly on the 2300 Zulu net Monday through Saturday, at 28.390. This informal net, dedicated since 1988 to helping the amateur radio community, is open to all stations.

Extra Accomplishment

Dan Savio of Ridgewood, New Jersey, passed his amateur Extra Class license exams last fall and received the callsign AA2GM. While many amateurs reach Extra Class status, Dan has achieved the feat at the age of 10. He has joined a select group of rare individuals!

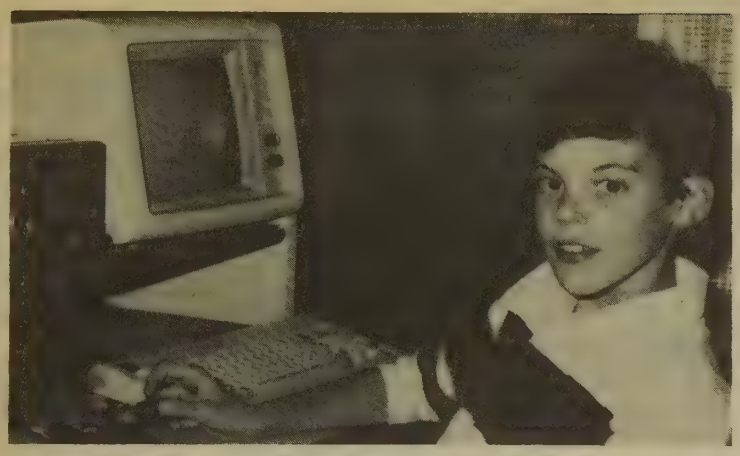


Photo A. Dan Savio AA2GM, a 10-year-old ham with many interests.

Dan is a member of the Fair Lawn Amateur Radio Club (NJ), where he took his Novice class and worked his first contact, an amateur in Argentina.

Besides amateur radio, his hobbies include model rocketry, aeromodeling, computers, rocks and minerals, and the violin. Dan says that he'd like to become an astronaut when he gets older. He loves to work CW, and he says that he now wants to get involved in learning about digital communications and OSCAR. "I think amateur radio is great," Dan says. "I wish more kids would get involved in it."

Dan comes from a family of amateurs. His 13-year-old sister, Caroline, holds the callsign KA2NOZ, and his father is CX6AQ (Uruguay) while awaiting his U.S. license. TNX Ed Efchak WX2R!

Photo B. A family of hams in Greece: SV5YS, SV5AYL, SV5TS, SV5AFS, andSV4AHS. TNX KDØJL.

The Truth . . . About Electronics

[Excerpt lightly edited from the "Moderator" via the "Broward Amateur Radio Club Bulletin." The specific author was not named.] As a newly licensed amateur radio operator studying to upgrade my privileges, I had a very hard time comprehending different electronic terms. I did a lot of research in my local library and discovered some little known facts.

One of the most often used and least understood terms is VSWR. VSWR is a contraction of VEESWAR. The VEESWAR is a small creature that lives in coaxial cable. VEESWARs look like a cross between the Munchkins and Dopey. They're so small they can only be seen with a scanning electron microscope. The VSWR ratio shows how many VEESWARs will feed on a single WATT of power. A well nourished VEESWAR needs to consume only a single WATT to remain healthy. VEESWARs that are not taken care of require more WATTs to stay alive. For example, a community of VEESWARs that consume three times the necessary number of WATTs has a ratio of 3:1. But a community of VEESWARs that consume only what they need for survival will provide a ratio of 1:1.

WATTs are also small creatures that travel through your coax to feed and graze. These cattle-like animals are very lazy, and will take the easiest route available to obtain their food, which they call "ground." Ground-round is a favorite food of Humans. In the same manner, ground-loops are a delicacy for WATTs. In order to obtain this sweet treat, WATTs will blow a hole in the side of your coax. WATTs were given their name by someone who asked, "How much power does an amateur handheld take to access a repeater?" When told the amount of power, he responded, "WATT?" The name and spelling took.

Many hams believe that their ANTENNAS actually send their signals into the atmosphere, to bounce off the ionosphere and eventually end up in some foreign land. Nothing could be further from the truth. ANTENNAS are actually cleverly designed devices that tap the combined energy of being. This energy was best described as the FORCE in the Star Wars trilogy. When WATTs travel through your coax, evading the hungry VEESWARs, they are sent by your ANTENNA into another dimension. There they wander aimlessly until they are sucked back into this dimension by someone else's ANTENNA.

Another term is dB. When English was being formed from German origins, the term Hammer and Dumbbell were interchangeable. As the science of electrons was developed, early experimenters looked for a term that would describe the level of power being absorbed by their ANTENNA. The level of received energy is equated as "being hit by a sledgehammer." An S-UNIT refers to the sledge factor. Anything over an S-9 (equal to a nine-pound sledgehammer) is given in dB. So a 20 over 9 would be equivalent to a nine-pound sledgehammer plus 20 dumbbells. Understanding these terms will help hams run their stations much more efficiently. This keeps other dimensions uncluttered and our VEESWARs in good health. It also prevents sledgehammers and dumbbells from falling out of the sky.

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested.

Send your ads and payment to *Radio Fun Flea Market*, Sue Colbert, Forest Road, Hancock NH 03449 and *get set for the phone calls.*

HOBBY/BROADCASTING/HAM/CB/SURVEILLANCE transmitters, amplifiers, cable TV, science, bugs, other great projects! Catalog, $1.00. PANAXIS, Box 130-R9, Paradise CA 95967. **RF**232

GIANT SOLAR PANELS $44.00 EACH! Excellent Prices/Solar Equipment/Accessories. Free Information/S.A.S.E., Catalog $3.00. To: Pak Rat Electronics, Box 690073, Houston TX 77269. (713) 893–0313.**RF**244

SIMPLEX REPEATERS $149.00! We manufacture them ourselves. Pak Rat Electronics. (713) 893–0313. **RF**245

MAXRAD TWO-METER ANTENNAS: base/mobile/portable. Call 1–800–283–2337, ext. 08883. Spreng Communications, Lake Crystal MN 56055-1002. **RF**246

GIFT IDEA! Morse code music—see our ad in the ad index (under Kawa Productions). **RF**247

RECEIVER, CONVERTER, 2-WAY RADIO EQUIPMENT. Test equipment, antennas. Have lots & will ship! Phone for list—Rene VE6WCA, Ph/Fax (403) 436–3427. **RF**248

QSLs. INEXPENSIVE, CUSTOMIZED. Free samples. K2MK, 551 Norwood Road, Mt. Laurel NJ 08054. FAX (609) 778–8683. Postage appreciated. **RF**249

WANTED—GOOD QUALITY GENERAL COVERAGE RECEIVER that will tune WARC bands with decent spread. Want to see—within 250 miles. No phone—write: Joe Mocker W2CZP, 215 Oregon Ave., Schenectady NY 12304. **RF**250

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31 kit, (219) 489–1711. P.O. Box 80096, Fort Wayne IN 46898. **RF**251

KENWOOD TR-2600—2 METER FM HT 3-yr. old, one owner. With 2 new NiCd battery packs, wall charger, 1 hard leather case & clip, 1 Kenwood speaker mike—MINT condition—10 memories with backlit dial—beautiful little radio. Great for new Techs. (412) 531–7443.**RF**253

COMPLETE HF SSB—CW STATION No antenna $160. I ship. MINT. N3IMJ, 257 Sebring Ave., Pittsburgh PA 15216. (412) 531–7443 anytime. **RF**254

BEGINNER KITS. Receivers, transmitters, and more. Stamp for catalog, 624 KITS, 171 Springlake Drive, Spartanburg SC 29302. **RF**261

JUST IMAGINE YOUR OWN BLUE RIDGE MOUNTAIN TOP 25-acre QTH in the cool, green mountains, only $975 per acre. Wonderful view, wild game, privacy, road frontage, small stream, ideal for hamming, retirement or summer home. Financing available. KK4WW, Floyd VA. (703) 763–3311. **RF**262

PREMIUM QSL CARDS Unique colorful designs, starting at $75 for 250. Send $1.00 for catalog and samples. BVE Professional Printing, 2023 Chicago Avenue, Suite B13-3, Riverside CA 92507. Tel. (714) 781–0252. **RF**264

WANTED: Yaesu FT-23R-HT and pre-1980 microcomputers for museum. KK4WW, (703) 231-6478/763–3311. **RF**265

REPOSSESSED VA & HUD HOMES available from government from $1 without credit check. You repair. Also S&L bailout properties. Call 1 (805) 682–7555, ext. H-5079 for repo list your area. **RF**269

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HOME-BREW COMPONENTS: MPF-102 4/$1.00 NE602AN $1.95 ea. T-50-6 4/$1.00, over 400 bargains, catalog LSASE. KA7QJY, Box 7970, Jackson WY 83001. (1–307–739–1634, evenings.)**RF**271

NEW!! NEW!! NEW!! NEW!! SPEAK TO THE WORLD Amateur radio language guide. •Written especially for the ham radio operator. •Hundreds of phrases. •Volume 1—incl. Spanish, German, French, Polish, and Japanese. •Volume 2—incl. Swedish, Italian, Portugese, Croatian, and Norwegian. •Send $10.00 per volume in U.S. (all others add $2.50 S&H). **ROSE**, P.O. Box 796, Mundelein IL 60060-0796. **RF**273

LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978–LARC. P.O. Box 24810, Philadelphia PA 19130. **RF**812

FREE Ham Gospel Tracts, SASE, N3FTT, 5133 Gramercy, Clifton Hts. PA 19018. **RF**960

QUADS 2 METER 4-ELE/440 8-ELE. $79.95. Lightning Bolt Antennas, RD 2 Rt. 19, Volant PA 16156. (412) 530–7396. **RF**992

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CONNECTICUT'S FAVORITE HAM STORE Rogus Electronics, 250 Meriden-wtby Turnpike, Southington 06489. (203) 621–2252. **RF**994

Join FAIRS—The Foundation for Amateur International Radio Service. FAIRS is hams dedicated to building international friendship by providing technical assistance, training, exchange visits, and equiment donations on a global basis. Free information. P.O. Box 341, Floyd VA 24091. (703) 763–3311/382–9099. **RF**995

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! CRB Research, Box 56-RF, Commack NY 11725. **RF**996

CERTIFICATE HUNTING IS FASCINATING! Rules for over 1700 awards in K1BV'S latest Directory. $17.45. Ted Melinosky, Box 960, Keene NY 03431-0960. **RF**997

VHF-UHF-SHF Large SASE, VHFer, P.O. Box 685, Holbrook AZ 86025. **RF**998

AMATEUR RADIO REPAIR!! All makes & models, any age. $20.00 per hour—maximum labor per unit, $80.00. TELO (Dan), 1302 S. Uplands Dr., Camano Island WA 98292. (206) 387–3558. **RF**999

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

20N018 **Technician Class License Manual: New No-Code** ***by Gordon West*** This book will cover everything you need to become a Technician Class Ham. Every exact question and answer on the examinations is found in this one book covering element 2 and element 3A question pools. Gordon West tells you the right answer and then explains in detail why the answer is correct. Fully illustrated text, frequency chart showing privileges, list of examiners and an FCC Form 610 application. **$9.95**

01B65 **The Beginner's Handbook of Amateur Radio—2nd Edition** ***by Clay Laster*** combines theory and practice in an easy-to-understand format, and provides information for choosing and installing radio receivers and transmitters, antennas, transmission lines, and test equipment. 400 pages, 291 illustrations. **$18.50**

20N092 **The Wonderful World of Ham Radio** ***by Richard Skolnik, KB4LCS*** This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick up one for the new ham in your life. **$7.95**

20N099 **Digital Electronics Projects for Beginners** ***by Owen Bishop*** contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings **$12.50**

20N100 **Electronics Build and Learn (2nd edition)** ***by RA Penfold*** combines theory and practice so that you can 'learn by doing.' Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

AR2073 **Novice Antenna Notebook** A beginner's guide to easy and effective antennas and tuners you can build. **$8.00** An ARRL Publication.

AR2871 **W1FB's Help for New Hams** ***by Doug DeMaw W1FB*** Complete for the newcomer. Put together a station and get on the air. **$10.00** An ARRL Publication.

AR2286 **First Steps in Radio** ***by Doug DeMaw W1FB*** Series of *QST* articles. See components assembled into practical circuits and how the circuits make up your radio gear. **$5.00** An ARRL Publication.

07R25 **The RTTY Listener** ***by Fred Osterman*** New and expanded version. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. It contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. 224 pages. **$19.95**

SHORTWAVE

09S42 **The Scanner Listener's Handbook** ***by Edward Soomre N2BFF*** Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** ***by Michael Schaay*** Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120pp. **$12.95**

03K205 **Guide to Radioteletype (RTTY) Stations** ***by J. Klingenfuss*** Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** ***by Tom Kneitel K2AES*** This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

11F52 **Ferrell's Confidential Frequency List** ***compiled by A.G. Halligey*** All frequencies from 4MHz—28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more 376 pp. **$19.50**

11EE06 **Guide to Embassy Espionage Communications** ***by Tom Kneitel K2AES*** Candid and probing examination of worldwide embassy and (alleged) espionage communication systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95** Advance the easy way with VIS Study Cards. Compact, Up-to-date Flash Cards with Key Words,

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Underlined Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.95**

Lanze Code Programs—(Available on 5 1/4" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part	Price
Novice	IBM01	COM01	$14.95
Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)	IBM05	COM05	$19.95

IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. $24.95

ANTENNAS

05A95 Easy-up Antennas for Radio Listeners and Hams ***by Edward M. Noll*** **Like to learn how to construct low-cost, easy-to-erect antennas?** ***Easy-up Antennas*** **will help you. $16.50**

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RF1291

vintage RF review

Heath HW-9 QRP CW Transceiver

by Mike Bryce WB8VGE

Photo A. The Heath HW-9 shown with the optional PSA-9 power supply.

Radio Fun *is pleased to bring you another Vintage Review of classic used equipment. Although Heathkit no longer produces the HW-9, keep an eye out for it at hamfests, swap nets or via the want ads.*

The HW-8 is a tough act to follow, but the Heath Company is betting on the HW-9 to take over now that the HW-8 is no more. After selling more than 15,000 units, Heath quietly removed the HW-8 from their catalog. This left a vacuum in under-5-watt transceivers, since Ten-Tec also dropped the Argonaut 515. No one seemed too eager to fill this void. That is until now, with the HW-9, a third-generation QRP (low power) transceiver from Heath.

The HW-9 is a CW-only transceiver that covers 80 through 15 meters. With the accessory HWA-9 band pack, you can extend coverage to all the WARC bands and the lower 250 kHz of 10 meters. The HW-9 also has full break-in keying (QSK), plus a newly designed wideband front end for no-tune-up operation.

I really don't know why Heath supplies screws for any of their radios—everyone who comes to my shack wants to see the insides of the newest Heath creation. Inside there are not one but two circuit boards, the oscillator and T/R circuit boards. Neither of the boards is double-sided, and both the boards are the same size as the case. It's quite crowded inside the HW-9, perhaps because Heath used the same size case as the old HW-8. They must have had some extra ones lying about in the metal shop. Gone is the infamous two-tone Heath green color scheme; in its place is a new bronze paint job.

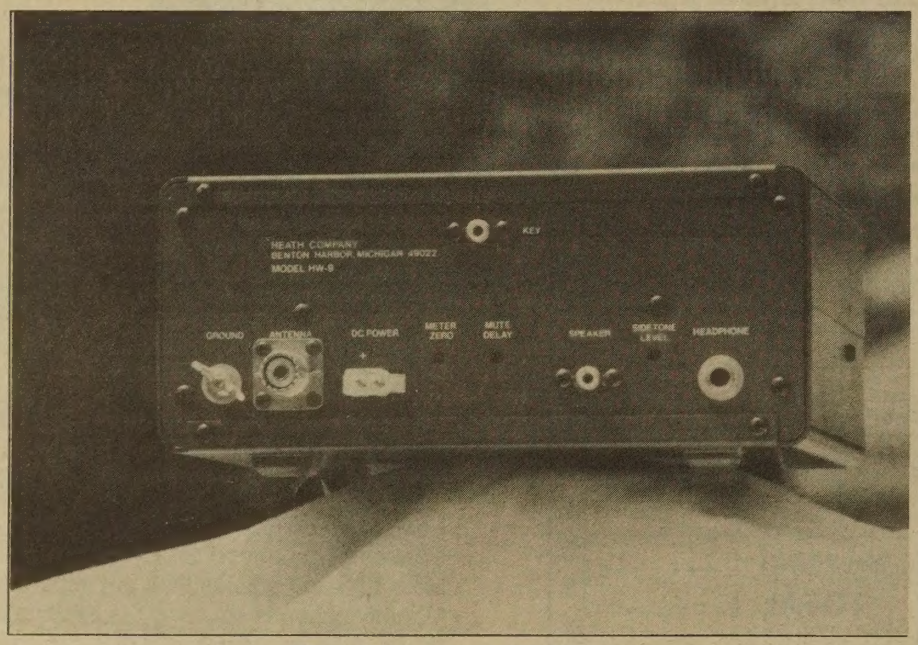

Photo B. Rear panel of the HW-9.

Features

The front panel has also been redesigned. Band selection is now done via a rotary switch instead of the older push-buttons, as was the case with the HW-8. Yelling and screaming from HW-8 users helped add two new features to the HW-9: receiver incremental tuning (RIT) and a superhet receiver (to succeed the often-cursed direct-conversion receiver that the HW-7 and HW-8 sported). The superhet receiver utilizes a 9 MHz IF and a four-pole crystal filter. An improved active audio filter and an audio amplifier that will drive a speaker or low-impedance headphones round things out for the receiver. The front-mounted meter gives relative S-units during receive and functions as a relative output meter during transmit.

The transmitter this time around had the power boosted to 4 watts output on all bands except 10. You'll get 3 watts out on 10 meters. A front-panel control will vary the transmitter output from zero to full power. The power amplifier is made up of two transistors in parallel to produce the RF output. A zener diode straps the collectors of both transistors to ground for protection against high SWR on the antenna. The HW-9 requires an external power supply that can supply 12.6 VDC at at least 1 ampere.

Construction

[Editor's note: It's unlikely that you'll find an unassembled HW-9, but do ask for a manual nonetheless in case you have to do any troubleshooting.]

Of course the HW-9 comes in kit form. I was surprised to see that only two pages of changes were included. What can I say about the manual? Classic Heathkit. I started construction by first cleaning off my work table, a major undertaking in its own right. I have to 'fess up a bit. Whenever I build a Heathkit, I never check parts off until they are ready to be installed. I do group like parts together in small piles; resistors in one pile, transistors in another, etc.

This HW-9 is the first Heathkit that I've assembled that uses taped components. Resistors, diodes, and small glass capacitors are mounted on tape strips. Each circuit board is set up in sections. By locating the proper taped parts, all one has to do is stuff the correct section. This sure is different from what I have been used to in the past from Heath. I did have some trouble with this new system. I started to go too fast and ignore the check-offs in the book. Somehow, in the wee hours of the morning, I got screwed up and installed parts in the wrong place on the T/R board. I recommend a slow pace when installing the taped components.

Construction begins with the oscillator board. Things went along quite well for a while until trouble raised its ugly head. The oscillator circuit board seemed to have a lot of extra holes left over after all the taped parts were installed. Hummmm, seems these are for the optional WARC band kit. Well, take it from me, install the WARC band kit while you're assembling the HW-9. To do so after the fact will involve a terrible amount of work.

The T/R board is quite dense. Use extra care with the tape components. There are two coils which must be wound for the transmitter. These must be done correctly or the transmitter will not work. After the boards are stuffed, cables are used to interconnect the different circuits. Instead of the usual Heath wiring harness, you make up your own. Small labels are used to mark the coaxial cables. After checking the soldering on both boards, you can finally get down to putting things together.

Mechanical assembly went smoothly. The end was in sight. VFO capacitor and front-panel controls were added to the chassis. The HW-9 started to take shape.

The HW-9 is a solid performer. QRP operator, Novice or CW buff will find it a welcome addition to the shack.

Alignment

After all the parts are installed, we can start some resistance tests. Now, I have to confess that I'm not much for doing resistance tests when building equipment. I did a few and things looked good, so I went on to alignment.

Alignment of the HW-9 requires the use of a VTVM or DVM, a frequency counter with a range to 10 MHz and an accuracy of 0.01%, and an RF detector—which Heath has built into the transceiver.

Everything seemed to be going just fine until I came to the VFO. Try as I could, I could not seem to get the VFO to track the dial. I spent most of an evening working on the problem. Oh, I did get things to perform, but only after I discovered that the main tuning dial slips. In fact, it slips a lot. The next morning I called Heathkit. Yep, we know of the problem, not much you can do, but here are some suggestions. Remove the VFO shield (the shield causes some binding). Reset the VFO capacitor (this may also cause some binding). Don't tune past the stops (this wears down the vernier drive). Well, I did all of the above and it worked, sort of. It appears that Heath, in order to keep the HW-9 the same size as the HW-8, had to use a much smaller vernier drive. The new drive is way too small for the job of tuning the VFO capacitor. What I finally did was to disassemble the vernier drive, bend the spring washers to add more drag, and reassemble it. So far, so good—I have not had any more trouble with the drive slipping.

Having fixed that problem, alignment continued along smoothly for several more manual pages—until I came to the page containing the transmit bandpass alignment. While I didn't have trouble with the alignment proper, the way it has to be done is a real pooper! To adjust the coils for the 15 meter band, you have to remove the bandswitch shaft. That's not much fun. Take your time and things should go smoothly, I hope.

The balance of the alignment went without a hitch. Finally, I was able to press on the blue and white label to the bottom cover. The HW-9 was done.

Operation

Operation proved a pleasant surprise. After the sidetone was adjusted to my liking, I fired up on 40 and gave a quick listen. The receiver proved quite sensitive. The S-meter is a bit Scotch, but can be adjusted to the end user's need. I had some audio howling when I went to a band position that was not active (I did not install the WARC kit). I had one of the IF stages oscillating; re-tuning the coils remedied the difficulty.

With a bit more kick out of the transmitter, I was able to work just about everything I heard. The QSK, while not quite up to Ten-Tec standards, worked flawlessly. I like the QSK time to be a bit slow and was able to set the time to my liking. The RIT and the audio filters work well. A speaker plugged into the HW-9 provides plenty of audio.

Will the HW-9 replace the HW-8? It sure has a good start. With all the features that everyone wanted on the HW-8, plus no-tune operation and WARC coverage, the HW-9 will fit the needs of the low-power operator. The HW-9 is a solid performer. QRP operator, Novice, or CW buff will find it a welcome addition to the shack.

[Ed. Note: The author, Michael Bryce WB8VGE, writes our Radio Magic *column, as well as the "QRP" column in* 73 Amateur Radio Today. *If you are now the proud owner of an HW-8 or HW-9, you might want to investigate his* Hot Water Handbook *($8.95), which describes modifications for the HW series of rigs. You can contact him at 2225 Mayflower NW, Massillon OH 44646.].* RF

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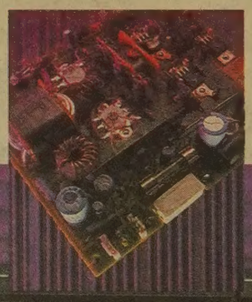

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